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AquAeTer, Inc. Brentwood, Tennessee

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TABLE OF CONTENTS

TABLE OF (CONTENTS	ii
TABLE OF I	FIGURES	vi
LIST OF AP	PENDIXES	viii
EXECUTIVE	E SUMMARY	ix
Sampling	Events	ix
Study Are	as	ix
Habitat As	ssessments	X
Observation	ons	xiii
SECTION 1	INTRODUCTION	14
1.1 PU	JRPOSE OF STUDY	14
1.2 SI	ΓES	15
	BJECTIVES	
1.4 FI	ELD CREW	16
1.5 PE	RMITS	16
SECTION 2	METHODS	17
2.1 SI	TE DESCRIPTIONS	17
2.1.1	Site 1 – Coffee Creek Background 1	17
2.1.2	Site 2 – Coffee Creek Background 2	17
2.1.3	Site 3 – Indian Creek	18
2.1.4	Site 4 – Coffee Creek Background 3	18
2.1.5	Site 5 – Coffee Creek Near Trestle	19
2.1.6	Site 6 – Mossy Lake	19
2.1.7	Site 7 – Felsenthal Reference Stream	
2.1.8	Site 8 – Wildcat Lake	21
2.1.9	Site 9 – Coffee Creek Downstream from Mossy Lake	
2.2 CC	OLLECTION METHODS	22
2.2.1	Water Quality Samples	22
2.2.2	Laboratory Samples	23
2.2.3	Habitat Assessment	
2.2.4	Fish Collection and Identification	25
2.2.5	Benthic Macroinvertebrate Collection and Identification	28
2.2.6	Sediment Sample Collection and Analysis	
2.3 LA	ABORATORY ANALYSIS METHODS	32
	ATA QUALITY REVIEW	
2.4.1	Water Quality and Sediment Samples	
2.4.2	Field Water Quality Parameters	
2.4.3	Fish Collection	34

2.4.4	Macroinvertebrate Collection	35
2.4.5	Habitat Assessment	
SECTION 3	RESULTS AND DISCUSSIONS	37
3.1 FIE	ELD EVENTS SUMMARY	37
3.1.1	Event 1	37
3.1.2	Event 2	38
3.1.3	Event 3	38
3.1.4	Event 4	39
3.2 SI	TE SUMMARIES	39
3.2.1	Site 1 – Coffee Creek Background 1 Summary	39
3.2.2	Site 2 – Coffee Creek Background 2 Summary	44
3.2.3	Site 3 – Indian Creek Summary	48
3.2.4	Site 4 – Coffee Creek Background 3 Summary	52
3.2.5	Site 5 – Coffee Creek Near Trestle Summary	56
3.2.6	Site 6 – Mossy Lake Summary	60
3.2.7	Site 7 – Felsenthal Reference Stream	64
3.2.8	Site 8 – Wildcat Lake Summary	68
3.2.9	Site 9 – Coffee Creek Downstream from Mossy Lake Summary	72
3.3 SIT	TE COMPARISONS	76
3.3.1	Comparison of Reference and Background Streams to Coffee Creek	76
3.3.2	Comparison of Reference Lake and Mossy Lake	77
REFERENCI	ES	80

LIST OF TABLES

TABLE NU	MBER TABLE TITLE	PAGE NUMBER
Table 1	Taxonomic Level of Identification	83
Table 2	Sampling Overview	84
Table 3	Laboratory Handling and Analysis	86
Table 4	Sampling Times for Event 1	
Table 5	Sampling Times for Event 2	
Table 6	Sampling Times for Event 3	
Table 7	Sampling Times for Event 4	
Table 8	Water Quality and Chemical Analyses Results for Site 1	91
Table 9	September 2011 Fish Sample Summary for Site 1	
Table 10	August 2012 Fish Sample Summary for Site 1	
Table 11	December 2011 Benthic Macroinvertebrate Sample Summary	
Table 12	May 2012 Benthic Macroinvertebrate Sample Summary for S	
Table 13	Water Quality and Chemical Analyses Results for Site 2	
Table 14	December 2011 Benthic Macroinvertebrate Sample Summary	
Table 15	May 2012 Benthic Macroinvertebrate Sample Summary for S	
Table 16	Water Quality and Chemical Analyses Results for Site 3	99
Table 17	December 2011 Benthic Macroinvertebrate Sample Summary	
Table 18	May 2012 Benthic Macroinvertebrate Sample Summary for S	
Table 19	Water Quality and Chemical Analyses Results for Site 4	
Table 20	December 2011 Benthic Macroinvertebrate Sample Summary	
Table 21	May 2012 Benthic Macroinvertebrate Sample Summary for S	
Table 22	Water Quality and Chemical Analyses Results for Site 5	
Table 23	August 2012 Fish Sample Summary for Site 5	
Table 24	December 2011 Benthic Macroinvertebrate Sample Summary	
Table 25	May 2012 Benthic Macroinvertebrate Sample Summary for S	
Table 26	Water Quality and Chemical Analyses Results for Site 6	
Table 27	August 2012 Fish Sample Survey for Site 6	
Table 28	December 2011 Benthic Macroinvertebrate Sample Summary	for Site 6111
Table 29	May 2012 Benthic Macroinvertebrate Sample Summary for S	
Table 30	Water Quality and Chemical Analyses Results for Site 7	
Table 31	December 2011 Benthic Macroinvertebrate Sample Summary	
Table 32	Water Quality and Chemical Analyses Results for Site 8	115
Table 33	September 2011 Fish Sample Survey for Site 8	
Table 34	August 2012 Fish Sample Survey for Site 8	
Table 35	December 2011 Benthic Macroinvertebrate Sample Summary	for Site 8118
Table 36	May 2012 Benthic Macroinvertebrate Sample Summary for S	
Table 37	Water Quality and Chemical Analyses Results for Site 9	120
Table 38	September 2011 Fish Sample Survey for Site 9	121
Table 39	August 2012 Fish Sample Survey for Site 9	
Table 40	May 2012 Benthic Macroinvertebrate Sample Summary for S	
Table 41	Water Quality Comparison of the Stream sites to the Reference	
	September 2011 Event	•

Table 42	Habitat and Biological Comparison of the Stream sites to the Reference Stream
	during the September 2011 Event
Table 43	Water Quality Comparison of the Stream sites to the Reference Stream during the
	December 2011 Event126
Table 44	Habitat and Biological Comparison of the Stream sites to the Reference Stream
	during the December 2011 Event127
Table 45	Water Quality Comparison of the Stream sites to the Reference Stream during the
	May 2012 Event
Table 46	Habitat and Biological Comparison of the Stream sites to the Reference Stream
	during the May 2012 Event129
Table 47	Water Quality Comparison of the Stream sites to the Reference Stream during the
	August 2012 Event
Table 48	Habitat and Biological Comparison of the Stream sites to the Reference Stream
	during the August 2012 Event131
Table 49	Water Quality Comparison of Mossy Lake to the Reference Lake during the
	September 2011 Event
Table 50	Habitat and Biological Comparison of Mossy Lake to the Reference Lake during
	the September 2011 Event
Table 51	Water Quality Comparison of Mossy Lake to the Reference Lake during the
	December 2011 Event
Table 52	Habitat and Biological Comparison of Mossy Lake to the Reference Lake during
	the December 2011 Event
Table 53	Water Quality Comparison of Mossy Lake to the Reference Lake during the May
	2012 Event
Table 54	Habitat and Biological Comparison of Mossy Lake to the Reference Lake during
	the May 2012 Event
Table 55	Water Quality Comparison of Mossy Lake to the Reference Lake during the
	August 2012 Event
Table 56	Habitat and Biological Comparison of Mossy Lake to the Reference Lake during
	the August 2012 Event

TABLE OF FIGURES

FIGURE NU	MBER	FIGURE TITLE PA	AGE NUMBER
Figure ES- 1	Sample Si	tes	142
Figure ES- 2		eek at Site 2	
Figure 1		Мар	
Figure 2		nic Map of Study Area	
Figure 3		p of Study Area	
Figure 4		nic and Aerial Map of Site 1	
Figure 5		h of Site 1	
Figure 6	Drainage A	Area of Site 1	149
Figure 7	Topograph	nic and Aerial Map of Site 2	150
Figure 8		h of Site 2	
Figure 9	Drainage A	Area of Site 2	152
Figure 10	Topograph	nic and Aerial Map of Site 3	153
Figure 11		h of Site 3	
Figure 12		Area of Site 3	
Figure 13	_	nic and Aerial Map of Site 4	
Figure 14		h of Site 4	
Figure 15		Area of Site 4	
Figure 16	Topograph	nic and Aerial Map of Site 5	159
Figure 17		h of Site 5	
Figure 18		Area of Site 5	
Figure 19	Topograph	nic and Aerial Map of Site 6	162
Figure 20		h of Site 6	
Figure 21		Area of Site 6	
Figure 22	Topograph	nic and Aerial Map of Site 7	165
Figure 23		h of Site 7	
Figure 24	Drainage A	Area of Site 7	167
Figure 25	Topograph	nic and Aerial Map of Site 8	168
Figure 26		h of Site 8	
Figure 27	Topograph	nic and Aerial Map of Site 9	170
Figure 28	Photograp	h of Site 9	171
Figure 29	Drainage A	Area of Site 9	172
Figure 30	Dissolved	Oxygen and Temperature Data at Site 1 for September 2	2011173
Figure 31	Dissolved	Oxygen and Temperature Data at Site 2 for September 2	2011174
Figure 32	Dissolved	Oxygen and Temperature Data at Site 3 for September 2	2011175
Figure 33	Dissolved	Oxygen and Temperature Data at Site 4 for September 2	2011176
Figure 34	Dissolved	Oxygen and Temperature Data at Site 5 for September 2	2011177
Figure 35	Dissolved	Oxygen and Temperature Data at Site 6 for September 2	2011178
Figure 36	Dissolved	Oxygen and Temperature Data at Site 7 for September 2	2011179
Figure 37	Dissolved	Oxygen and Temperature Data at Site 8 for September 2	2011180
Figure 38	Dissolved	Oxygen and Temperature Data at Site 9 for September 2	2011181
Figure 39	Dissolved	Oxygen and Temperature Data at Site 1 for December 2	2011182
Figure 40	Dissolved	Oxygen and Temperature Data at Site 2 for December 2	2011183
Figure 41	Dissolved	Oxygen and Temperature Data at Site 3 for December 2	2011184

Figure 42	Dissolved Oxygen and Temperature Data at Site 4 for December 2011	185
Figure 43	Dissolved Oxygen and Temperature Data at Site 5 for December 2011	186
Figure 44	Dissolved Oxygen and Temperature Data at Site 6 for December 2011	187
Figure 45	Dissolved Oxygen and Temperature Data at Site 7 for December 2011	188
Figure 46	Dissolved Oxygen and Temperature Data at Site 8 for December 2011	189
Figure 47	Dissolved Oxygen and Temperature Data at Site 9 for December 2011	190
Figure 48	Dissolved Oxygen and Temperature Data at Site 1 for May 2012	191
Figure 49	Dissolved Oxygen and Temperature Data at Site 2 for May 2012	192
Figure 50	Dissolved Oxygen and Temperature Data at Site 3 for May 2012	193
Figure 51	Dissolved Oxygen and Temperature Data at Site 4 for May 2012	194
Figure 52	Dissolved Oxygen and Temperature Data at Site 5 for May 2012	195
Figure 53	Dissolved Oxygen and Temperature Data at Site 6 for May 2012	196
Figure 54	Dissolved Oxygen and Temperature Data at Site 7 for May 2012	197
Figure 55	Dissolved Oxygen and Temperature Data at Site 8 for May 2012	198
Figure 56	Dissolved Oxygen and Temperature Data at Site 9 for May 2012	199
Figure 57	Dissolved Oxygen and Temperature Data at Site 1 for August 2012	200
Figure 58	Dissolved Oxygen and Temperature Data at Site 2 for August 2012	201
Figure 59	Dissolved Oxygen and Temperature Data at Site 3 for August 2012	202
Figure 60	Dissolved Oxygen and Temperature Data at Site 4 for August 2012	203
Figure 61	Dissolved Oxygen and Temperature Data at Site 5 for August 2012	204
Figure 62	Dissolved Oxygen and Temperature Data at Site 6 for August 2012	205
Figure 63	Dissolved Oxygen and Temperature Data at Site 7 for August 2012	206
Figure 64	Dissolved Oxygen and Temperature Data at Site 8 for August 2012	207
Figure 65	Dissolved Oxygen and Temperature Data at Site 9 for August 2012	208

LIST OF APPENDIXES

APPENDIX NUMBER APPENDIX TITLE

Finalized Work Plan
AquAeTer Qualifications
Data Verification
Field Notes and Data Sheets from September 2011
Photographs from September 2011
Laboratory Report from September 2011
Field Notes and Data Sheets from December 2011
Photographs from December 2011
Laboratory Report from December 2011
Field Notes and Data Sheets from May 2012
Photographs from May 2012
Laboratory Report from May 2012
Field Notes and Data Sheets from August 2012
Photographs from August 2012
Laboratory Report from August 2012
Fish Species Verification
Benthic Macroinvertebrate Species Verification

EXECUTIVE SUMMARY

The purpose of this study was to collect data from Coffee Creek and Mossy Lake in order to allow the Arkansas Department of Environmental Quality (ADEQ) to determine the appropriate designated use and evaluate existing use variations for Coffee Creek and Mossy Lake. The study included sample collections in Coffee Creek and Mossy Lake as well as a reference stream and a reference lake, both of which are located in the Felsenthal National Wildlife Refuge upriver from any influence from the Georgia-Pacific Crossett mill discharges.

Sampling Events

There were four field events conducted for the UAA which were conducted in September 2011 for fisheries, in December 2011 for macrobenthos, in May 2012 for macrobenthos, and in August 2012 for fisheries. Based on all four sampling events, Coffee Creek as it exists upstream from the confluence with the Georgia-Pacific effluent channel is a wet-weather conveyance, except when it is part of the Ouachita River during flooding. There is no continual source of water to feed into Coffee Creek. This is indicative of similar streams of this size in the Ouachita River basin in the area of Crossett. The reference stream and three other stream crossings in the Felsenthal National Wildlife Refuge were consistently dry except following rain events. Coffee Creek at Site 5 would have been dry except for the influence of the Georgia-Pacific effluent since no flow was recorded from upstream sources (Site 4 and upstream sites). This is also true for Mossy Lake and Site 9 although there may be stagnant water remaining from rain events or from Ouachita River flooding in low-lying areas. There was no upstream natural flow coming into these low areas of the Lake during the four study events. Without the maintenance to maintain the dikes and weir structure along the downstream side of Mossy Lake by Georgia-Pacific or the volumetric flow rate provided by Georgia-Pacific's effluent, Mossy Lake would revert back to forested wetlands similar in structure to Site 4, with water potentially remaining year-round in the deepest pools in between rain events and annual floods.

Study Areas

Water quality data, sediment type, aquatic species including fish and macrobenthos, and aquatic habitat information were collected during the study. The study area consisted of nine sites, as presented in Figure ES- 1, and listed below:

- 1. Coffee Creek, upstream from any influence of Georgia-Pacific's effluent;
- 2. Coffee Creek, at the site listed in the Parson's report (December 2007) as a Reference Stream that was a tributary to Coffee Creek;
- 3. Indian Creek, a tributary to Coffee Creek;
- 4. Coffee Creek, upstream from the confluence with the Georgia-Pacific effluent;

- 5. Coffee Creek, upstream from Mossy Lake and containing Georgia-Pacific effluent:
- 6. Mossy Lake;
- 7. A reference stream that is an unnamed tributary in Felsenthal National Wildlife Refuge and upriver from any influence from the effluent discharge from the Mill;
- 8. A reference lake, Wildcat Lake, located in Felsenthal National Wildlife Refuge; and also situated upstream from any influence from the effluent discharge from the Mill; and,
- 9. The present Coffee Creek/effluent channel, downstream from Mossy Lake (added at the request of the USEPA, Region 6).

During the field study, the field team collected data on the physical, chemical, and biological characteristics of Coffee Creek and Mossy Lake. The field team also collected data on the physical, chemical, and biological characteristics on a reference lake within the Felsenthal National Wildlife Refuge; specifically, Wildcat Lake, a swamp-like lake that is connected hydraulically to the Ouachita River year-round. Two fish collection events and two benthic macroinvertebrate collection events were performed at each of these stations.

Sites 2, 3, and 4 were dry during two of the four events, as depicted in Figure ES- 2. The only time they contained water was following rain events, but even during these two post-rain events, there was no measurable flow at these sites. Sites 5 and 6 were under the influence of the Georgia-Pacific effluent during all events. Site 9 was under the influence of Georgia-Pacific for the three events when the area was not flooded by the Ouachita River. During the December 2011 field event the Ouachita River had receded from Mossy Lake, but Site 9 was still part of the Ouachita River.

Habitat Assessments

Habitat assessments were performed for all sites for all four field events. During the first field event, all stream and lake sites were evaluated utilizing the U.S. Environmental Protection Agency (USEPA) Rapid Bioassessment Protocol, Physical Characterization and Habitat Assessment Forms for Low Gradient Streams (Barbour et al. 1999). However, it was determined that this form was not optimal for the evaluation of the lake/wetland type habitats present in Wildcat Lake or Mossy Lake, Sites 8 and 6, respectively. During the remaining field events, the lake habitats were evaluated using the Lake Habitat Assessment Field Sheet (DEP-SOP-001/01: Form FD 9000-6) developed by the Florida Department of Environmental Protection (FDEP). Habitat assessments at each site were mostly consistent across sampling events, with the

differences in scoring based on water availability in the channel and impacts from recent sediment deposition.

The Reference Stream was dry or had no measureable flow during three of the four field events, with water present in the channel only during the December 2011 field event. Despite the absence of water, a habitat score could be calculated for the Reference Stream, but the final score could have been higher if water had been present during all of the field events. Site 9 received a higher habitat assessment score than the reference stream during the August 2012 field event; however, the reference stream did not have water in the channel and this resulted in a lower value for Site 7 due to the lack of channel flow, epifaunal substrate, and available cover. During the third event (Spring 2012), Site 4 had a habitat score that was equal to the habitat score of the non-wetted reference stream. Aside from these two instances, none of the other sites on Coffee Creek, or the three other events at site 4 or site 9 met or exceeded the habitat score for the reference stream.

Both lake habitats were wet during all four field events. Fish population assessments were performed on the two lake habitats during the September 2011 and August 2012 field events. Fish sampling was successful for Site 8 at Wildcat Lake during both events, while fish sampling for Site 6 at Mossy Lake was only marginally successful for the August 2012 event. The sampling methodology for the September 2011 field event was boat electrofishing, but was later modified to include experimental gillnetting, fyke nets, and mini-fyke nets for the August 2012 field event. The change in methodology increased the results at Wildcat Lake, the Reference Lake, from 111 total fish representing 14 taxa to 160 total fish representing 17 taxa. The change in methodology resulted in the collection of 4 fish from 3 different taxa at Mossy Lake. This was an improvement from the first fish sampling field event, where no fish were collected. Although fish were collected at both lakes, there is a distinct difference in the population size and diversity between Mossy Lake and the Reference Lake at Site 8, primarily due to Site 8 being directly connected to the flow from the Ouachita River year-round because of Felsenthal Lock and Dam. Mossy Lake was not sampled during a time when there was a hydraulic connection between Mossy Lake and the Ouachita River, although the December 2011 and the May 2012 macrobenthos sampling events followed within a few days a period when the Ouachita River had overflowed into Mossy Lake.

Rainfall prior to the sampling event and previous flooding of the Ouachita River contributed to the presence of water at Sites 1 through 6, 8, and 9 for both the December 2011 and the May 2012 sampling events, although these was no flowing water at sites 1 through 4 on Coffee Creek and Indian Creek.

Mossy Lake becomes hydraulically connected to the Ouachita River when the River elevation gets above about 62.4 feet above the National Geodetic Vertical Datum of 1929 (ft NGVD) or historically reported at 65 ft above mean seal level (AMSL). Mossy Lake was not

sampled during any of the four events when the Ouachita River was above 62.4 ft NGVD and therefore Mossy Lake was not directly hydraulically connected to the Ouachita River; however, the December 2011 and May 2012 macrobenthos sampling events were conducted after the Ouachita River had receded below elevation 62.4 ft NGVD a few days prior to the sampling event. Prior to the May 2012 field study, the Ouachita River was above bank full stage from March 14, 2012 to April 26, 2012 at elevations ranging from 65.11 to 72.91 feet above the National Geodetic Vertical Datum 1929 (ft NGVD29). During flood stage periods on the Ouachita River, the water elevation upstream and downstream from the weir structure at the Felsenthal Dam is equal or the river is in a "free flow" condition. Mossy Lake receives flow from the Ouachita River at or above Elevation 62.4 ft NGVD29 or 65 ft AMSL.

Fish population assessments were performed on the stream sampling locations when water was present during the September 2011 and August 2012 field events. Sites 1 and 9 were the only sites that were successfully assessed for fish populations during the September 2011 event, while Sites 1, 5, and 9 resulted in fish captures during the August 2012 event. Site 1 had the most diverse and abundant community of the three successfully sampled streams during both the September 2011 and August 2012 field events. Site 1 was the only stream channel upstream from the mill that consistently held water and provided habitat for both benthic macroinvertebrates and fish. This is attributed to the channel morphology created from high levels of sedimentation. Only 1 fish was collected at Site 5 between the two fish sampling field events. Fish sampling activities at Site 9, downstream from Mossy Lake, produced fish during both fish sampling events, although the density and diversity at both sites were low. Site 9 is directly connected to the Ouachita River and fisheries found here have migrated from the Ouachita River the short distance up to Site 9.

Benthic macroinvertebrate sampling was conducted on both lakes during the December 2011 and May 2012 field events. The benthic macroinvertebrate community during the December 2011 field event was similar in diversity and abundance but differed in EPT diversity, functional feeding group dominance, mean tolerance value, and dominant species. Wildcat Lake exhibited a slightly higher density, was dominated by the collector/gather functional feeding group, and had 3 EPT taxa present. Mossy Lake did not have EPT taxa and was dominated by the shredder functional feeding group. During the May 2012 field event, both sites were more similar in diversity and density, with both sites having EPT taxa present and being dominated by the predator functional feeding group. Site 6 was dominated by the tolerant taxa Chironomidae, while Site 8 was dominated by beetles from the Dytiscidae family. The increased density and diversity at Site 6 is most likely attributable to the recent inundation by the Ouachita River that occurred prior to the May 2012 field event.

Benthic community composition for the December 2011 field event was similar across most of the stream sites in terms of specimen abundance, species diversity, and functional feeding group dominance. Site 5 exhibited greater species diversity but was dominated by the

pollution tolerant Chironomidae family of flies. No specimens of the EPT category (Ephemeroptera+Plecoptera+Trichoptera) were collected during the December 2011 event. Benthic macroinvertebrate community composition for the May 2011 was more variable based on specimen abundance and diversity. A small amount of EPT taxa were collected at Sites 1 and 9. No direct comparisons were available for the reference stream because it was a dry channel during this sampling event and benthic macroinvertebrate collections were not possible.

Observations

Based on the above data, the key factor related to whether areas of Coffee Creek and Mossy Lake can support aquatic life is the periodic occurrence and impact of flooding conditions. Since these water bodies are essentially part of the Ouachita River during these flooding events, the water quality criteria for the Ouachita River should apply to those flooded areas during those times. Mossy Lake quickly reverts to a swamp-like state during non-flooding conditions. Thus, it would seem some type of seasonal water quality criteria should be applied to these waterbodies based on flooding conditions. It is noted that the Ouachita River during flooding periods does not typically achieve the water quality standard for dissolved oxygen (DO) for the Gulf Coast Ecoregion and instead has its own DO criteria specified in Regulation 2 during these periods. Historically, DO concentrations of 1 to 3 mg/L have been recorded upstream from Coffee Creek in the Ouachita River during these periods. Wildcat Lake was chosen for its similarity in appearance to Mossy Lake for this study. However, it was found that the direct connection to the Ouachita River was constant and that Wildcat Lake is a part of the Ouachita River/Felsenthal Reservoir system year-round and not just during flooding events. Other than this connection to the Ouachita River, Wildcat Lake would have no flow coming into it except during flood events on the Ouachita River. Mossy Lake does not have a direct connection to the Ouachita River, since the weir gate is a physical obstruction, and only receives flood waters from the Ouachita River periodically. The weir gate controls the existence of Mossy Lake in its present surface area. If the weir gate were removed, only portions of the streambed channel in Mossy Lake near the location of the weir gate, which had a maximum depth of about 5.5 ft with most of the channel being 3 ft or less deep, would likely be backed up with water from the Ouachita River at the higher river stages greater than about 56.9 ft NGVD29. Without the treated effluent, flowing water would not be present year-round in Mossy Lake. Thus, Mossy Lake cannot be expected to attain the same biological diversity that exists in Wildcat Lake.

SECTION 1

INTRODUCTION

1.1 PURPOSE OF STUDY

AquAeTer, Inc. (AquAeTer) located in Brentwood, Tennessee, was requested by Georgia-Pacific – Crossett LLC located in Crossett, Arkansas to conduct a Use Attainability Analysis (UAA) study of Coffee Creek and Mossy Lake. The purpose of this study was to collect data that will allow the Arkansas Department of Environmental Quality (ADEQ) to determine the appropriate designated use and evaluate existing use variations for Coffee Creek and Mossy Lake in accordance with the requirements specified in Arkansas Pollution Control and Ecology Commission Regulation 2 (APCEC Regulation 2), which establishes water quality standards for surface waters of the State of Arkansas (adopted on August 26, 2011).

A Work Plan was developed and provided to ADEQ and USEPA for comments. Upon review, the USEPA requested that one extra station be added to the study. The final approved Work Plan is provided in Appendix 1.

The water quality standards set in Regulation 2 are based upon present, future, and potential uses of the surface waters of the state, criteria developed from statistical evaluations of past water quality conditions and a comprehensive study of least-disturbed reference streams within the ecoregion. Section 2.102 of the regulations states that "the standards are designed to enhance the quality, value, and beneficial uses of the water resources of the State of Arkansas, to aid in the prevention, control, and abatement of water pollution, to provide for the protection and propagation of fish and wildlife, and to provide for recreation in and on the water" (Arkansas Pollution Control and Ecology Commission, 2011).

Regulation 2 also gives minimum water quality criteria that a stream must meet to be classified under one of ADEQ's designated use classifications. The designated use classifications specified in Regulation 2 are as follows:

- Extraordinary Resource Waters
- Ecologically Sensitive Waterbodies
- Natural and Scenic Waterways
- Primary Contact Recreation
- Secondary Contact Recreation
- Aquatic Life (based on proposed revisions to "Fisheries" in Regulation 2, January 2013)
- Domestic Water Supply

1.2 SITES

This report summarizes the four field events conducted for the UAA which were conducted in September 2011, December 2011, May 2012, and August 2012. The location of the study area is presented in Figure 1. The study area is presented on a topographic map in Figure 2 and on an aerial map in Figure 3.

Eight sites were originally selected for the UAA after conducting a reconnaissance of the area with ADEQ Water Quality staff. A ninth site, Site 9, was added at the request of the United States Environmental Protection Agency (USEPA), Region 6, in Dallas, Texas. Site 9 is under the continual influence of the Ouachita River and also receives the effluent from the Georgia-Pacific Crossett mill. The nine sites selected for data collection are as follows:

- 1. Site 1 Coffee Creek Background Station which is at an elevation of approximately 102 ft NGVD29 and never under the influence of floodwaters from the Ouachita River;
- 2. Site 2 Coffee Creek @ Parsons/USEPA Reference Site which is at an approximate elevation of 77 ft NGVD29 and can be influenced by the Ouachita River during extreme flooding;
- 3. Site 3 Indian Creek near Sulphur Springs which is a tributary to Coffee Creek located at an approximate elevation of 71 ft NGVD29 and seasonally influenced by the Ouachita River;
- 4. Site 4 Coffee Creek west of Sulphur Springs which is located approximately 65 ft NGVD29 and seasonally influenced by the Ouachita River;
- 5. Site 5 Coffee Creek near the confluence with the GP Effluent Canal which is located at an approximate elevation of 63 ft NGVD29, influenced by the Georgia-Pacific effluent canal discharges, and seasonally influenced by the Ouachita River);
- 6. Site 6 Mossy Lake which is seasonally influenced by the Ouachita River when the Ouachita River reaches an elevation of approximately 62.4 ft NGVD29;
- 7. Site 7 Felsenthal Reference Stream which is located at an approximate elevation of 74 ft NGVD29 and seasonally influenced by the Ouachita River;
- 8. Site 8 Wildcat Lake which is a swamp lake in the Felsenthal Reservoir directly connected to the Ouachita River and the reference lake to Mossy Lake; and

9. Site 9 – Coffee Creek downstream from Mossy Lake which is directly connected to the Ouachita River.

1.3 OBJECTIVES

The purpose of this investigation was to collect the necessary data to allow ADEQ to determine the appropriate designated use classifications for Coffee Creek and Mossy Lake as defined under APCEC Regulation 2. During the field study, the field team collected data on the physical, chemical and biological characteristics of Coffee Creek and Mossy Lake. The field team also collected data on the physical, chemical, and biological characteristics of a Reference Lake within the Felsenthal National Wildlife Refuge; specifically, Wildcat Lake, a swamp lake that is connected directly to the Ouachita River and a Reference Stream in the Felsenthal Reservoir system. Both of these sites are upriver from Coffee Creek and Mossy Lake, and have never been under the influence of Coffee Creek, Mossy Lake or the Georgia-Pacific effluent.

1.4 FIELD CREW

All field work associated with this project was performed by members of AquAeTer, Inc. Employees of Georgia-Pacific assisted AquAeTer by providing access and local knowledge of site locations. Resumes for members of the AquAeTer project team are presented in Appendix 2.

1.5 PERMITS

The field work was conducted under the following permits:

- Arkansas Game & Fish Commission, Scientific Collection Permit Number 072920112; and
- United States Department of the Interior, Fish and Wildlife Service, South Arkansas National Wildlife Refuge Complex, Scientific Collection Permit Number 2011-027.

SECTION 2

METHODS

2.1 SITE DESCRIPTIONS

2.1.1 Site 1 – Coffee Creek Background 1

Site 1 is located at Coffee Creek mile (CCM) 11.5 and drains an upland area of the Coffee Creek drainage basin. Site 1 is downstream from the city of Crossett, Arkansas, and Lucas Pond, located in Crossett City Park, as presented in Figure 4. Site 1 is approximately 11.5 miles upstream from the non-flooded confluence with the Ouachita River. Since the construction of the aeration stabilization basin (ASB) at the Georgia-Pacific facility in approximately 1956, Site 1 has not received any influence from the Georgia-Pacific effluent and is not currently influenced by flood waters from the Ouachita River. Site 1 has not been flooded by the Ouachita River since the Felsenthal Dam was installed in 1970 and there is no record of a flood event on the Ouachita River reaching Site 1. A representative photograph of Site 1 is presented in Figure 5.

The drainage area at Site 1 is approximately 5.4 square miles (mi²), as presented in Figure 6. Since the drainage area is less than 10 mi², the site is designated by APCEC Regulation 2, 2.302(D) as Secondary Contact Recreation (waters where secondary activities like boating, fishing or wading are involved) unless designated as Primary Contact Recreation (waters where full body contact is involved) after site verification. Site 1 during many months of the year has no measureable flow and only puddles in depressed areas of the Creek.

2.1.2 Site 2 – Coffee Creek Background 2

Site 2 is located on Coffee Creek at Coffee Creek Mile (CCM) 8.7 and is located downstream from Site 1 by approximately 2.8 miles. Coffee Creek at Site 2 runs to the east of the Georgia-Pacific effluent canal. Site 2 is approximately 8.7 miles upstream from the confluence with the Ouachita River, as presented in Figure 7. This site is located at an approximate elevation of 75 ft NGVD29 and during extreme floods can be inundated by the Ouachita River. The record elevation for the Ouachita River at the Felsenthal Lock and Dam is 88.3 ft NGVD 29. At these flood stage levels, the flow in the Ouachita River is greater than 20,000 cubic feet per second (cfs) and the Georgia-Pacific discharge would represent less than 0.5 percent of the flow in the River. Therefore, the Georgia-Pacific effluent is not expected to have any measurable impact at this site during these flood conditions. A representative photograph of Site 2 is presented in Figure 8.

The drainage area for Coffee Creek at Site 2 is approximately 9.4 mi² as presented in Figure 9. Since the drainage area is less than 10 mi², the site is designated by APCEC Regulation 2.302 (D) as Secondary Contact Recreation (waters where secondary activities like boating, fishing or wading are involved) unless designated as Primary Contact Recreation (waters where full body contact is involved) after site verification.

The current designated uses for Coffee Creek given in APCEC Regulation 2 are:

- Secondary contact recreation;
- Agricultural and industrial water supply;
- No fishable/swimmable or domestic water supply uses;
- Exempt from 2.406 color; and
- Exempt from Chapter 5: Specific Standards.

2.1.3 Site 3 – Indian Creek

Site 3 is located on Indian Creek. Indian Creek is a tributary to Coffee Creek that drains forested, wetland, and agricultural areas. Site 3 is approximately 1 mile upstream from the confluence with Coffee Creek, as presented in Figure 10. The drainage basin is similar to the drainage basin of the upper part of Coffee Creek. The confluence of Indian Creek and Coffee Creek is upstream from Site 4 and downstream from Site 2. The elevation at this site is approximately 75-ft NGVD29 and during extreme floods may be inundated by the Ouachita River. A representative photograph of Site 3 is presented in Figure 11.

The drainage area for Indian Creek at Site 3 is approximately 5.0 mi² as presented in Figure 12. Since the drainage area is less than 10 mi², the site is designated as Secondary Contact Recreation (waters where secondary activities like boating, fishing or wading are involved) unless designated as Primary Contact Recreation (waters where full body contact is involved) after site verification.

2.1.4 Site 4 – Coffee Creek Background 3

Coffee Creek at Site 4 is downstream from Site 2 and upstream from Site 5, and is located downstream from the junction with Indian Creek. Site 4 is approximately 5.8 miles upstream from the confluence with the Ouachita River. At Site 4, Coffee Creek runs just east and parallel to the Georgia-Pacific effluent canal as presented in FFigure 13. This site can be inundated during flooding of the Ouachita River. Waters from Georgia-Pacific could conceivably mix with these waters during flooding events. During flooding events that reach Site 4, the volume of water from the Ouachita River is much greater than the volume of water from the Mill. The potential effects to this site from Georgia-Pacific are expected to be minimal because of the differences in volume. A representative photograph of Site 4 is presented in Figure 14.

The drainage area for Coffee Creek at Site 4 is approximately 10.82 mi² as presented in Figure 15. Since the drainage area is greater than 10 mi², the site can be designated as Primary Contact Recreation (waters where full body contact is involved) without verification.

The current designated uses for this site on Coffee Creek given in APCEC Regulation 2 are the same as those specified for Site 2.

2.1.5 Site 5 – Coffee Creek Near Trestle

At Site 5, Coffee Creek is a braided stream in a forested wetland that eventually opens into Mossy Lake. The channel that was sampled was approximately 175 feet across. The channel has thick deposits of sediment and woody debris. Large islands of grasses and brush are present in the stream channel.

During the field activities, Site 5 was classified as Georgia-Pacific effluent. The effluent is currently distributed into multiple locations as it merges with the Coffee Creek channel from the effluent canal. Site 5 is approximately 4.7 miles upstream from the confluence with the Ouachita River, as presented in Figure 16. This portion of Coffee Creek appears to be under the influence of Georgia-Pacific. The average instantaneous specific conductivity was 2,113-micromhos per centimeter (μ mhos/cm). A representative photograph of Site 5 is presented in Figure 17.

The drainage area at Site 5 is approximately 36.6 square miles (mi²), as presented in Figure 18. Since the drainage area is greater than 10 mi², the site can be designated as Primary Contact Recreation (waters where full body contact is involved) without verification. Site 5 had a resident alligator, as determined from multiple sightings throughout the four-field events.

The current designated uses for this site on Coffee Creek given in APCEC Regulation 2 are the same as those specified for Site 2.

2.1.6 Site 6 – Mossy Lake

Mossy Lake is downstream from Sites 1 through 5 and directly upstream from Site 9. The lake surface water level of Mossy Lake is controlled by dikes and a weir structure, maintained by Georgia-Pacific, and the weir structure is located about 0.67 mi upstream from the confluence of the current Coffee Creek and the Ouachita River. An aerial photograph and topographical map of Mossy Lake is presented in Figure 19. Mossy Lake is estimated to be 584 acres in size, although the surface area can fluctuate depending upon the water level in Mossy Lake as controlled by the weir control structure. Mossy Lake for the most part has water level depths of about 1 to 3 ft with some channel areas around 4 to 5.5 ft in depth. Mossy Lake is the receiving water for Coffee Creek (when it is flowing) and the Georgia-Pacific effluent. Coffee Creek was not flowing during any of the four sampling events during the UAA study. Mossy

Lake is inundated during flood periods on the Ouachita River when elevations exceed about 62.4-ft NGVD29. A representative photograph of Mossy Lake is presented in Figure 20.

The drainage area at Mossy Lake is approximately 47.6 square miles (mi²), as presented in Figure 21. Since the drainage area is greater than 10 mi², the site can be designated as Primary Contact Recreation (waters where full body contact is involved) without verification.

Mossy Lake was used for wastewater treatment for the mill complex beginning in the 1930's when it was modified to increase retention time for wastewater treatment. The modifications that have enlarged and defined Mossy Lake prior to 1970 included the installations of levees to enlarge the area; the installation of roads on the levees to facilitate maintenance; and the installation of the weir gate discharge structure with a downward opening weir gate. The top elevation of the maintained levees around Mossy Lake is approximately at 65-ft NGVD29.

In 2013, the bottom elevations of Mossy Lake were measured at 5-foot intervals approximately 20 yards and 100 yards upstream from the weir gate control structure in the open area of Mossy Lake in order to establish the "bottom" elevation of Mossy Lake. Based on the elevation of the top of the concrete weir gate structure being at 68.0-ft NGVD29, the lowest elevation measured in these two cross sections was 56.9-ft. However, most of the depths in these two cross sections taken were very shallow (less than 2 to 3 feet deep). AquAeTer measured lake depths in Mossy Lake in November 2003 and much of the Lake was >1 to 3 ft deep.

While Mossy Lake is inundated when the Ouachita River typically floods each year, Mossy Lake has essentially been modified with a dam (i.e., the maintained levees and weir gate control structure). It exists as a defined lake as function of the presence of this dam. Even if the dam is removed, its surface area would be largely reduced to a center channel into which Ouachita River water would back up, depending on the river stage. Mossy Lake would not be a perennial lake in the absence of the weir gate and dikes.

The current designated uses for Mossy Lake given in Arkansas Regulation 2 are:

- Secondary contact recreation;
- Agricultural and industrial water supply;
- No fishable/swimmable or domestic water supply uses;
- Exempt from 2.406 color; and
- Exempt from Chapter 5: Specific Standards.

2.1.7 Site 7 – Felsenthal Reference Stream

Site 7 is an unnamed, forested wetland tributary that flows through a culvert beneath Pine Island Access Road within the Felsenthal National Wildlife Refuge, as presented in Figure 22. Site 7 is approximately 1.8 miles upstream from the confluence with Wildcat Lake. This

tributary is very similar in visual appearance to Coffee Creek upstream from the confluence with the Georgia-Pacific effluent. A representative photograph of Site 7 is presented in Figure 23.

The drainage area for the Reference Stream at Site 7 is approximately 2.7 mi², as presented in Figure 24. Since the drainage area is less than 10 mi², the site is designated as Secondary Contact Recreation (waters where secondary activities like boating, fishing or wading are involved) unless designated as Primary Contact Recreation (waters where full body contact is involved) after site verification.

2.1.8 Site 8 – Wildcat Lake

Wildcat Lake in the Felsenthal National Wildlife Refuge was selected as the regional Reference Lake. Wildcat Lake is located in the Ouachita River drainage basin upstream from any influence of Mossy Lake or Coffee Creek. Wildcat Lake is located upstream from the Felsenthal Lock and Dam and is presented in Figure 25. A representative photograph of Site 8 is presented in Figure 26.

Wildcat Lake is part of the Felsenthal Reservoir system, with direct connections to the Ouachita River. The Lake waters are most likely backwaters or diverted waters from the Ouachita River, with little to no flow entering from the local drainage basin. The drainage area of the Ouachita River at Felsenthal Lock and Dam is 10,782 square miles. Since the drainage area is greater than 10 mi², the site is designated as Primary Contact Recreation (waters where full body contact is involved).

Wildcat Lake was chosen for its similarity in appearance to Mossy Lake for this study. It was determined in the course of the study that the direct connection to the Ouachita River was constant and that Wildcat Lake (unlike Mossy Lake) is a part of the Ouachita River/Felsenthal Reservoir system year-round and not just during flooding events. Mossy Lake, with or without the Georgia-Pacific effluent, would not have the Ouachita River flowing through it year-round. Thus, Mossy Lake cannot be expected to attain the same biological diversity that exists in Wildcat Lake. Without the maintenance of the dikes and weir structure by Georgia-Pacific and the treated effluent entering Mossy Lake from Georgia-Pacific, water would not be present year-round in the majority of Mossy Lake.

2.1.9 Site 9 – Coffee Creek Downstream from Mossy Lake

The channel at Site 9 that is directly downstream from Mossy Lake is about 0.6 mile upstream from the confluence with the Ouachita River, as presented in Figure 27. This portion of the channel is referred to as "Coffee Creek" though it has characteristics of a man-modified or constructed channel, such as straight, channelized runs which are completely different in character from the meandering, shallow channel upstream portions of Coffee Creek. As can be seen from an early USGS map in 1939 (after modifications to Mossy Lake had already

occurred), this relatively straight channel exists next to a road that leads to the river. It is more likely historically that the upstream portions of Coffee Creek and Mossy Lake were connected to the Ouachita River through what is now depicted on the 1981 USGS map as "Gar Slough", that is located on the southeastern side of Mossy Lake next to the entrance road to the Mossy Lake area. However, for the purposes of this report, Site 9 will be referred to as "Coffee Creek" though we believe that more evaluation of historical documents may indicate otherwise.

This section of Coffee Creek is under the influence of Georgia-Pacific as well as the Ouachita River. A representative photograph of Site 9 is presented in Figure 28.

The drainage area at Site 9 is approximately 47.6 square miles (mi²), as presented in Figure 29. Since the drainage area is greater than 10 mi², verification would not be needed to designate it as Primary Contact Recreation (waters where full body contact is involved).

The current designated uses for this site on Coffee Creek given in APCEC Regulation 2 are the same as those specified for Site 2.

2.2 COLLECTION METHODS

2.2.1 Water Quality Samples

Water quality parameters were taken at each sample location if water was present during the field event. The following parameters were sampled:

- DO (% Saturation);
- pH (Standard Units);
- Specific conductance at 25°C as conductivity (milliSiemens per centimeter, mS/cm);
- Temperature (°C) departure from equilibrium; and
- Turbidity (Nephelometric turbidity units, NTU).

Diurnal measurements of DO, pH, specific conductance, and temperature were collected at fixed locations for at least two consecutive days. The deployed instruments for the two day readings were Hach/Hydrolab Mini-Sonde 4a (sonde) multi-probe instruments at Sites 1 through 5, and 7 and the Hach/Hydrolab Data-Sonde 5 (sonde) for Sites 6, 8, and 9. Each sonde was calibrated for pH, conductivity, and dissolved oxygen before and after deployment.

Instantaneous readings of DO, pH, specific conductance, and temperature were also taken. The instruments used for instantaneous water quality readings were Hach Quanta multiprobe instruments. Both Quanta multiprobe instruments were calibrated at the beginning and end of each day.

Turbidity measurements were made in the field at each station. A Hach turbidity meter was used to collect the turbidity readings.

2.2.2 Laboratory Samples

Water samples for laboratory chemical analyses were collected at each sample location if water was present during the field event. Grab samples were collected from one foot below water surface, except where total water depth was less than two feet. Where the water depth was less than two feet, water samples were collected at mid-depth in the water column. The following parameters were sampled:

- Fecal coliform density (#/100 mL);
- BOD₅ (mg/L);
- Nitrate-N (mg/L);
- Dissolved Ortho-Phosphate (mg/L);
- Total solids (mg/L);
- Total dissolved solids or TDS (mg/L);
- Total suspended solids (mg/L);
- Chloride (mg/L); and
- Sulfate (mg/L).

Samples were collected in accordance with laboratory guidance, packed on wet ice, and sent to the laboratory under chain of custody.

2.2.3 Habitat Assessment

A habitat assessment was performed for each stream station according to the procedures outlined in the EPA Rapid Bioassessment Protocol (Barbour et al. 1999). The EPA Rapid Bioassessment Protocol (EPA RBP) Habitat Assessment Field Data Sheet for low gradient streams and the Physical Characterization/Water Quality Field Data Sheet were utilized to evaluate each habitat parameter.

A habitat assessment was performed at each lake sampling station using the EPA RBP Habitat Assessment Field Data Sheet for low gradient streams and the Physical Characterization/Water Quality Field Data Sheet for Field Event 1. Due to the poor suitability of these data sheets for lake assessments, and since ADEQ does not have a lake habitat assessment sheet, the Lake Habitat Assessment Field Sheet (DEP-SOP-001/01: Form FD 9000-6) developed by Florida Department of Environmental Protection was used for the lake habitat evaluations for the remaining sampling events, Field Events 2, 3, and 4.

2.2.3.1 Stream Habitat Assessment

Stream habitat assessments included the following parameters:

- Suspended Solids and Sedimentation;
- Pools, Riffles, and Substrate Composition;
- Channel Characteristics and Effects of Channelization;
- Temperature; and
- Riparian Evaluations.

Each stream sampling reach was evaluated for sediment deposition in the channel, which is often indicated by the development of point bars and islands. The inorganic substrate components were estimated for percent composition within the sampling reach. Sediment samples were collected for laboratory analysis of grain size for Events 2, 3, and 4.

Each stream sampling reach was evaluated to determine the mixture and type of substrate materials and to determine the channel flow characteristics. In-stream flow was measured using standard USGS velocity measurement techniques (CITE). Stream sampling reaches were also assessed for the presence of channelization, shoring structures or embankments, bridge abutments, or signs of dredging.

Stream water temperature was measured using a Quanta Hydrolab hand-held meter. Additionally, available cover and vegetative protection was evaluated.

An assessment of stream riparian condition was performed to determine the predominant vegetative species and level of cover provided to the stream. Bank stability was evaluated for signs of scouring or degradation and all signs of human impacts to the stream reach or watershed were noted.

2.2.3.2 Lake Habitat Assessment

Lake habitat evaluations included the following parameters:

- Hydrology;
- Color;
- Secchi depth;
- Vegetation Quality;
- Stormwater Inputs;
- Bottom Substrate Quality;
- Lakeside Adverse Human Alterations;
- Upland Buffer Zone; and
- Adverse Watershed Land Use.

Lake hydrology was evaluated for the presence of water inflow or outflow and a general range of water residence time was recorded. Lake turbidity or clarity was evaluated using a Secchi disk. A Secchi disk was used to determine water clarity and visual assessments were conducted to determine the color of the water and to search for the presence of obvious oils or sheens on the water surface.

Vegetation quality was assessed for diversity and percent cover and the upland buffer zone were evaluated for the quality, quantity, and distribution of native vegetation between the uplands and littoral zone. If present, nuisance aquatic taxa were documented. An assessment of the bottom substrate quality was performed to determine the mixture of sand, detritus, coarse particulate organic matter, and mud, muck, or algal growth.

The presence of lakeside adverse human alterations were evaluated based on the amount of man-made structures, roads, or other human disturbances adjacent to the lake. Stormwater inputs were also evaluated based on indirect versus direct input of stormwater and the amount of Best Management Practices (BMPs) in place. The watershed surrounding each lake habitat was evaluated for the presence of or potential for impacts from adverse human uses.

2.2.4 Fish Collection and Identification

2.2.4.1 Stream Collection Procedures

Streams were sampled using a Smith-Root model 15-B backpack electrofisher when the conductivity was low enough in the stream to achieve the proper power density. Samples were collected from all available habitats for two concurrent summers. Field teams consisted of at least three workers: one to operate probes or carry backpacks; one to net stunned fish; and one to carry a bucket for stunned fish and document the fish sampling activities.

If the stream conductivity was too high to use the backpack electrofisher, the streams were sampled for fish by seining or deploying fyke nets, mini-fyke nets, or experimental gill nets.

Each stream sampling reach was sampled until the lead biologist determined that all meso- (i.e. pool, riffle, run) and microhabitats (i.e. pool tails and margins, glides, etc.) had been sufficiently represented in the sample. Fish less than 20 millimeters were not included in the reporting and were released. When possible, individuals were identified to species in the field and released. Remaining individuals were preserved in isopropyl alcohol and transported to the biology lab for identification. Fish were identified to the lowest possible taxonomic level. A representative sample or photograph of each species was collected for Quality Assurance/Quality Control (QA/QC) identification by an outside biologist.

2.2.4.2 Lake Collection Procedures

Mossy Lake and Wildcat Lake were sampled for fish using the ADEQ Fisheries Division Standard Sampling Procedures for electrofishing as guidance with the following exception: instead of sampling in the spring or fall, sampling was conducted during the summer, as per the ADEQ guidance for sampling streams. In addition to electrofishing, fyke nets, mini-fyke nets, and an experimental gill net were used to sample fish during the second fish collection field event (Field Event 4). The Rapid Bioassessment Protocol and the Revised Protocols for Sampling Algal, Invertebrate, and Fish Communities as Part of the National Water-Quality Assessment Program (USGS, 2002) was used as guidance. No ADEQ guidance documents were found for fyke net procedures. The procedures for each method will be described in further detail below. Fish species, length, weight and any anomalies were recorded on the Fish Sampling Field Data Sheet.

2.2.4.2.1 <u>Electrofishing</u>

When possible, electrofishing power settings were standardized at each sample site. After measuring water conductivity and temperature, Table 2 within the Arkansas Game and Fish Commission Fisheries Division Standard Sampling Procedures was used to determine the appropriate power settings. Electrofishing at the standardized power settings helped ensure potential transfer of 3,000 watts from water to fish. Power (watts) is calculated as the volts multiplied by the amps. Due to the variability of the conductivity of the water, various electrofisher settings were tested until fish were detected visually.

Each study lake was considered one sampling section. Field personnel attempted to electrofish one complete circuit around the perimeter of the lake. The reference lake and the impacted lake were electrofished an equivalent amount of time per trip.

A Garmin Montana 650t Global Positioning System (GPS) was used to mark sampling locations and a sketch of the lake was drawn. Field data sheets were completed for each lake. Data sheets included water quality measurements, a habitat assessment, and a description of the fish collected. When possible, the species of large individuals were identified, then measured, and weighed in the field and released. Fish less than 20 millimeters were not included in the reporting and were released. A voucher collection of species of a manageable size were preserved in isopropyl alcohol and transported to the lab for identification. Detailed photographs were taken of larger specimens that were not practical to include in the voucher collection. Fish were identified to the lowest possible taxonomic level. All identifications were verified by an outside biologist.

2.2.4.2.2 Fyke Nets

High conductivity levels and lack of visibility due to high color in Mossy Lake resulted in the inability to effectively electrofish during the first field event. As a result, fyke nets were deployed to collect fish samples throughout the second field event. Fyke nets were deployed in representative habitat types and in areas with highest likelihood of fish capture. The nets were set from the boat by anchoring the lead and then the remaining portions were deployed as the boat moved in reverse. When the lead was fully extended, the pot was put overboard and anchored into position. Fish were removed by lifting only the pot into the boat and placing the fish in a bucket. The fyke nets were set in the late afternoon and retrieved the next morning. The set time and pick up time and location of the nets were recorded on the field data sheets.

A Garmin Montana 650t GPS unit was used to mark sampling locations and a sketch of the lake was drawn illustrating major landmarks and sampling locations. Field data sheets were completed for each site. The data sheets included water quality measurements, a habitat assessment, and a description of the fish collected. When possible, large individuals were identified to species, measured, and weighed in the field and released. Fish less than 20 millimeters were not included in the reporting and were released. A voucher collection representing the captured species were preserved in isopropyl alcohol and transported to the lab for identification. Detailed photographs of specimens were taken of species that were not included in the voucher collection. Fish were identified to the lowest possible taxonomic level.

2.2.4.2.3 <u>Experimental Gill Nets</u>

High conductivity levels and lack of visibility due to high color in Mossy Lake resulted in the inability to effectively electrofish during the first field event. As a result, fyke nets and an experimental gill net were used to collect fish during the second field event. The experimental gill net was set perpendicular to the shoreline in an area with potential fish habitat based on known fish behavior. The net was set from the boat by placing the small bar mesh closest to the shoreline and then extending the net while moving the boat in reverse. The experimental panels increased in bar mesh size as the net moved further from the shore into open water. When all of the panels were fully extended, the end of the net was staked or anchored into position and marked with a float. Fish were removed by lifting a small portion of the net into the boat at a time, where fish were carefully removed from the net and placed into the live well. This procedure was repeated with the next section of net until all fish had been removed. The experimental gill net was set in the late afternoon and retrieved the next morning. The set time and pick up time and location of the net was recorded.

A Garmin Montana 650t GPS unit was used to mark sampling locations and a sketch of the lake was drawn that illustrated relevant landmarks and the location of all net sets. Field data sheets were completed for each site and included water quality measurements, a habitat assessment, and a description of the fish collected. When possible, the species of large

individuals were identified, then measured, and weighed in the field and released. Fish less than 20 millimeters were not included in the reporting and were released. A voucher collection of collected specimens was preserved in isopropyl alcohol and transported to the lab for identification. Detailed photographs of specimens were taken of species that were not included in the voucher collection. Fish were identified to the lowest possible taxonomic level.

2.2.4.3 Sample Storage

Samples were placed in five-gallon buckets filled with water from the collection waterbody until fish were processed or preserved for collection. Individuals that were sent to the laboratory for collection were preserved in isopropyl alcohol, placed into properly labeled containers, and transported to the laboratory for identification.

If more than one jar was required for a sample site, the jars were labeled with the following format: ## of ##. The jar was labeled with tape affixed to the lid of each sample jar in addition to Rite-in-the-Rain paper inside the jar. The label contained the following information:

- Sample site ID;
- Location/Stream;
- Date and Time;
- Collectors' initials;
- Sampling Method Used; and
- ## of ##.

Any additional information was documented in a field notebook with the same information above. The fish sampling field data sheets were attached to any associated field notes.

2.2.5 Benthic Macroinvertebrate Collection and Identification

2.2.5.1 Stream Collection Procedures

Macroinvertebrate sampling was completed using ADEQ's Standard Operating Procedure for Macroinvertebrate Sampling Methodology for Wadeable Streams (April 2010), the Revised Protocols for Sampling Algal, Invertebrate, and Fish Communities as Part of the National Water-Quality Assessment Program (USGS 2002), and the Rapid Bioassessment Protocol (Barbour et al. 1999) for guidance.

The proportional sampling method was utilized for collecting macroinvertebrates in wadeable streams, with specific methodology described below. Benthic macroinvertebrate sampling was conducted on a semi-annual (fall and spring) basis. Fall sampling was delayed as a result of flood waters being present and resulted in the fall field collection event being conducted in early December. The spring sampling event was conducted in early May.

Sample reaches were selected to represent local in-stream characteristics. When possible, reaches were at least 100 meters upstream of any road or bridge crossings to minimize effects on velocity, depth, and overall habitat quality. There were no major tributaries, springs, municipal or industrial discharges directly adjacent to the stream in the study reach, except at Site 5 and Site 9. These two sites were determined to be primarily treated effluent during non-flood stage periods.

Before macroinvertebrate sampling, the physical and chemical characteristics of the sampling reach were measured and documented. Care was taken during this process to minimize disturbance within the sample reach. If the sampler walked through the stream, he/she walked downstream from the area to be sampled for macroinvertebrates. Characteristics that were measured and recorded included, but were not limited to reach length, substrate type, flow, dissolved oxygen, pH, water temperature, bank stability, canopy cover and riparian zone vegetative composition. A Habitat Assessment Field sheet was completed for each reach. A site sketch was completed illustrating the site characteristics and locations of major landmarks. A Garmin Montana 650t GPS unit was used to mark and record sampling reach coordinates.

Each stream reach was sampled using the proportional sampling method because the research goals for this study required that all available habitat types be sampled. Additionally, this sampling method was the most appropriate for use in low gradient streams in the gulf coastal region. A 100-meter reach was visually examined and relative proportions of available macroinvertebrate habitats were recorded in the field data book. Each habitat type was sampled in proportion to its representation within the reach. For example, if snag habitat made up 50% of the reach, then 50% of the samples (10) were collected from snag habitats. The sampler then continued moving in an upstream direction collecting a total of 20 habitat grabs over the length of the reach.

An individual sampling effort consisted of a "grab" sample. Grab samples were performed in rootwads, detritus, vegetation or deadfall type habitats. A grab is a qualitative sampling technique consisting of forcefully jabbing and sweeping a D-frame net into a productive habitat. Each grab swept a linear distance of 0.5 meters (Barbour et al. 1999), and the same effort was applied to each grab. Grab samples were directed toward the center of the frame so that dislodged organisms were carried into the mouth of the net.

After each grab sample was collected, the contents of the net were emptied into a sieve bucket with 500 micron mesh bottom to prevent loss of specimen. This created a composite sample for the reach. Large debris (rocks, leaves, and sticks) were brushed and rinsed of any attached organisms and discarded outside of the sample area. Samplers used caution in order to prevent damaging specimens.

After sampling was complete, the net was shaken and rinsed with water to dislodge any debris or stray organisms into the sieve bucket. Any remaining visible organisms were carefully

removed from the net with forceps. Remaining debris was rinsed to remove organisms and discarded.

2.2.5.1.1 <u>Woody-Snag Sampling Method</u>

When present, woody snags were sampled for macroinvertebrates. At each snag location, at least two pieces of woody debris were sampled. The attached organisms were removed by handpicking, brushing or rinsing the surface of each branch into a plastic bucket. After initial brushing, the snags were placed in an empty bucket for an hour and the procedure was repeated. Collected specimens were placed in a sample container with preservative and returned to the laboratory for taxonomic identification.

2.2.5.2 Lake Collection Procedures

Mossy Lake and Wildcat Lake were sampled for macroinvertebrates using the ADEQ Fisheries Division Standard Sampling Procedures, Recommended Protocols for Sampling and the EPA Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish (RBP), Second Edition (Barbour et al. 1999). The habitat assessment field sheets and macroinvertebrate sampling field sheets were attached to any associated field notes.

Both lakes were sampled using a proportional sampling method; however, due to low water levels in both lakes and obstructions from submerged cypress knees and logs, many areas of the lakes were inaccessible. The lake habitats were visually examined and relative proportions of available productive macroinvertebrate habitats were recorded in the field data book. The samplers then collected a total of 20 samples in different lake habitats. Each habitat type was sampled in proportion to its representation within the reach. For example, if snag habitat made up 50% of the reach, then 50% samples were taken in snag habitats.

Woody snags were sampled for macroinvertebrates. At each site, at least two snags were sampled. A net was placed downstream to capture any lost mobile species and then the snag was removed with a saw or loping shears. The attached organisms were removed by handpicking, brushing or rinsing the surface of each branch into a plastic bucket. After initial brushing, the snags were placed in an empty bucket for an hour and then re-sampled by handpicking, brushing and rinsing. The specimens collected were placed into a sample container with preservative and brought to the laboratory for taxonomic identification.

A Garmin Montana 650t GPS was used to mark sampling locations and a sketch of the lake was drawn to illustrate major landmarks and sample locations. Field data sheets were completed for each site and included water quality measurements, a sediment description, and a description of the macroinvertebrates collected. The ponar grabs and snags were field screened

for live organisms and live organisms were collected and placed into sample jars according to the procedures described below.

2.2.5.3 Sample Storage

Macroinvertebrate samples were placed in labeled, plastic wide-mouth jars filled with 70% isopropyl alcohol. Samples loosely filled the jar(s) three fourths (3/4) full or less. Samples were delivered to and stored in the lab for subsampling, sorting, and taxonomic identification.

If more than one jar was required for a sample site, jars were labeled with the following format: ## of ##. The jars were labeled with Rite-in-the-Rain paper and indelible ink inside the jar. The label contained the following information:

- Sample site ID;
- Location/Stream:
- Date and Time:
- Collectors' initials;
- Sampling Method Used; and
- ## of ##.

Any additional information was documented in a field notebook with the same information above.

2.2.5.4 Laboratory Analysis

Stream samples were processed in the laboratory and sorted to a target of 300 organisms (+/-10%). Samples that were excessively abundant were subsampled according to the ADEQ Standard Operating Procedures for Sampling Macroinvertebrates in Wadeable Streams. Squares were selected one at a time using a random numbers table. The entire contents of the square were evenly distributed on a gridded sorting pan. The square was visibly inspected to ensure all organisms were removed. Any organism that spanned multiple squares was considered as in the square that contained its head. If an organism without an easily distinguishable head (such as an Oligochaeta) spanned multiple squares, it was considered as in the square that contained the majority of the body.

A dissecting microscope was used to count the randomly chosen squares until a target count of 300 organisms (+/- 10%) was obtained. All of the individuals in a square were counted regardless if the target count of 300 organisms was reached. Organisms must have contained a head and enough features to identify it to a reasonable taxonomic level to have been counted. Also, organisms were not counted if they only contained an empty shell or just skin. Olighochaets were counted without a head if one terminal end was present

Subsamples were placed in a jar with 70% isopropyl alcohol. Each subsample jar was labeled on the outside of the top of the lid and with a piece of paper inside the jar. Labels were clearly written, in pencil or indelible ink, with the site number, sample collection date, number of individuals contained within the subsample, initials of the person who collected the sample, subsample date, and the initials of the laboratory personnel performing the subsampling procedures.

Macroinvertebrates were identified to the lowest taxonomic level feasibly possible as presented in Table 1.

Distinct taxa groups for each sample were placed into one or two dram glass vials filled with 70% isopropyl alcohol, to 90% capacity, and stored in a partitioned box. Vials were logged onto the macroinvertebrate identification form. The Quality Control procedures were followed as outlined in the **AquAeTer** Quality Assurance Project Plan (QAPP).

2.2.6 Sediment Sample Collection and Analysis

Sediment samples were collected at each sample location during the December 2011, May 2012, and August 2012 field events. Samples were stored at ambient temperature until the grain size analysis. The samples were analyzed using AquAeTer SOP L008, Soil Grain Size Distribution By Sieve and Hydrometer Analysis, which is based on ASTM Method D 422-63 (Reapproved 1998), Standard Test Method for Particle-Size Analysis of Soils.

2.3 LABORATORY ANALYSIS METHODS

Water samples were collected for laboratory analysis during each field event at each site if water was present. American Interplex Corporation Laboratories in Little Rock, Arkansas conducted all chemical analyses. A sampling overview is provided in Table 2. A summary of the laboratory handling and analysis is provided in Table 3.

2.4 DATA QUALITY REVIEW

2.4.1 Water Quality and Sediment Samples

Data Quality Verification Reports for all the water and sediment analysis are provided in Appendix 3. The appendix contains four Data Quality Verification Reports that correspond to the five sampling events.

2.4.2 Field Water Quality Parameters

Field notes describing conditions, unexpected situations, and equipment failures during each event are noted below.

2.4.2.1 <u>Event 1 – September 2011</u>

Water quality instruments (Sondes or mini-Sondes) were deployed at Site 1 (Upstream Coffee Creek), Site 5 (Coffee Creek upstream from Mossy Lake), Site 6 (Mossy Lake), Site 8 (Wildcat Lake), and Site 9 (Coffee Creek downstream from Mossy Lake). The deployment and retrieval dates and times are presented in Table 4. Water samples that were collected from each of these sites are also presented in Table 4. Due to the short hold time for fecal coliform analysis, these samples may have been collected separately from the other water quality samples at each station. The sample collection times for the fecal coliform analysis are also presented in Table 4. The dissolved oxygen and temperature measurements are presented for each site in Figure 30 through Figure 38.

No water was present in Coffee Creek at Sites 2 or 4 during this event. Water at Site 1 was not flowing and was confined to a pool in the creek. No water was present in Indian Creek at Site 3 or at the unnamed tributary at Site 7. Therefore, water quality instrumentation was not deployed at Sites 2, 3, 4, or 7. No water samples were collected from Sites 2, 3, 4, or 7.

2.4.2.2 <u>Event 2 – December 2011</u>

Water quality instruments (Sondes or mini-Sondes) were deployed at all sites except for Site 9 (Coffee Creek downstream from Mossy Lake). The deployment and retrieval dates and times are presented in Table 5. Water samples that were collected from each of these sites are also presented in Table 5. Due to the short hold time for fecal coliform analysis, these samples may have been collected separately from the other water quality samples at each station. The sample collection times for the fecal coliform analysis are also presented in Table 5. The dissolved oxygen and temperature measurements are presented for each site in Figure 39 through Figure 47.

At the time of this study, the Ouachita River had only recently receded from Mossy Lake and had not yet receded from the area of Site 9. Site 9 was a part of the Ouachita River and was not sampled.

2.4.2.3 Event 3 – May 2012

Water quality instruments (Sondes or mini-Sondes) were deployed at all sites except for Site 7 (Unnamed tributary). The deployment and retrieval dates and times are presented in Table 6. Water samples that were collected from each of these sites are also presented in Table 6. Due to the short hold time for fecal coliform analysis, these samples may have been collected separately from the other water quality samples at each station. The sample collection times for the fecal coliform analysis are also presented in Table 6. The dissolved oxygen and temperature measurements are presented for each site in Figure 48 through 56.

The reference stream at Site 7 did not have any water present. No water quality measurements or samples for water quality analysis were collected.

2.4.2.4 <u>Event 4 – August 2012</u>

Water quality instruments (Sondes or mini-Sondes) were deployed at Site 1 (Upstream Coffee Creek), Site 5 (Coffee Creek upstream from Mossy Lake), Site 6 (Mossy Lake), Site 8 (Wildcat Lake), and Site 9 (Coffee Creek downstream from Mossy Lake). The deployment and retrieval dates and times are presented in Table 7. Water samples that were collected from each of these sites are also presented in Table 7. Due to the short hold time for fecal coliform analysis, these samples may have been collected separately from the other water quality samples at each station. The sample collection times for the fecal coliform analysis are also presented in Table 7. The dissolved oxygen and temperature measurements are presented for each site in Figure 57 through 65.

No water was present in Coffee Creek at Sites 2 or 4 during this event. Water at Site 1 was not flowing and was confined to a pool in the creek. No water was present in Indian Creek at Site 3 or at the unnamed tributary at Site 7. Therefore, water quality instrumentation was not deployed at Sites 2, 3, 4, or 7. No water samples were collected from Sites 2, 3, 4, or 7.

2.4.3 Fish Collection

2.4.3.1 Event 1 – September 2011

During the September 2011 fish sampling event, no water was present in the channel at Sites 2, 3, 4, or 7. As a result of the absence of water, fish sampling activities could not be performed.

There were no quality assurance issues with electrofishing at Site 1 with the backpack electrofisher.

The backpack electrofisher was unable to be utilized at Site 5 due to the elevated conductivity in the water. The presence of an alligator at Site 5 halted use of the seine net. The creek was too shallow to properly deploy the fyke nets. Therefore, fish collection at Site 5 was not able to be completed during this trip.

The backpack electrofisher was unable to be utilized at Site 9 due to the elevated conductivity in the water. Seining was marginally successful but was halted for health and safety purposes due to the observation of multiple water moccasins (*Agkistrodon piscivorus*) located in the sampling reach during the seining attempts. Quality assurance objectives for fish collection were met at Site 9.

The target time for electrofishing at Site 6 was not met. However, representative areas of Mossy Lake were electrofished during the abbreviated sampling time frame.

Due to the problem on Mossy Lake, the time for electrofishing on Site 8 was modified to match Site 6. Representative areas of Wildcat Lake were electrofished.

2.4.3.2 Event 4 – August 2012

Fish collection was not able to be completed at Sites 2, 3, 4, or 7 due to the absence of water at these locations.

There were no quality assurance issues with the fish collection from Sites 1, 5, 6, 8, and 9 during the August 2012 field event.

2.4.4 Macroinvertebrate Collection

2.4.4.1 Event 1 – December 2011

The target sample density was 300 organisms (+/-10%) for each sample site. The target number was not achieved at any of the nine benthic macroinvertebrate sampling locations during the December 2011 field event. No samples were collected from Site 9 due to inaccessibility resulting from flooding at the site and the necessary access roads by the Ouachita River. All remaining sample sites were close to or over 200 (+/-10%) organisms. Sample densities ranged from 184 specimens at site 3 to 235 specimens at site 8.

2.4.4.2 Event 2 - May 2012

The target sample density was 300 organisms (+/-10%) for each sample site. The target number was not achieved at any of the nine benthic macroinvertebrate sampling locations during the May 2012 field event. Site 7 was a completely dry channel at the time of the field event and therefore sampling for macroinvertebrates was not possible. The remaining eight sample sites were sampled with five of those sites having sample densities greater than 200 organisms and included sites 1, 4, 6, 8, and 9. Sampling sites 2 and 5 both had densities well below the target of 300 organisms, with site 5 having the lowest density at 51 specimens.

2.4.5 Habitat Assessment

2.4.5.1 Event 1 – September 2011

Habitat assessments were performed for 8 of the 9 sample sites during the September 2011 field event. A habitat assessment was not performed at site 9 due to inaccessibility resulting from flooding by the Ouachita River. The elevated water levels inundated the access roads and the sampling reach at site 9. The remaining 8 sites were assessed without deviations;

however sites 2, 3, 4, and 7 were dry channels during the field event. The absence of water in the channel did have an effect on the habitat scores and subsequent habitat comparability ratings.

2.4.5.2 Event 2 – December 2011

Habitat assessments were performed for 8 of the 9 sample sites during the December 2011 field event. A habitat assessment was not performed at site 9 due to inaccessibility resulting from this site being the Ouachita River due to flooding from the Ouachita River. The elevated water levels inundated the access roads and the entire sampling reach at site 9. The remaining 8 sites were assessed without limitations or deviations.

2.4.5.3 Event 3 – May 2012

Habitat assessments were performed for all 9 of the sample sites during the May 2012 field event. During the May 2012 field event, Site 7 was a completely dry channel and resulted in a significantly lower habitat score for the reference stream than was found in the two previous field events. The presence and depth of water in a channel are important in the overall habitat assessment scoring methodology and therefore resulted in a lower value for Site 7 during the May 2012 field event.

2.4.5.4 <u>Event 4 – August 2012</u>

Habitat assessments were performed for all 9 sample sites during the August 2012 field event. Sample sites 2, 3, 4, and 7 were dry channels during the August 2012 sampling event. The presence of dry channel conditions resulted in lower habitat assessment scores and did have an effect on the percent comparability with the reference streams.

SECTION 3

RESULTS AND DISCUSSIONS

3.1 FIELD EVENTS SUMMARY

Four field events were conducted for the UAA. The field team adhered to the Work Plan as closely as field conditions would permit. Below is a summary of what was completed during each event. A sampling overview is located in Table 2.

3.1.1 Event 1

Field Event 1 was conducted September 11, 2011 through September 15, 2011. The goals for this event were to conduct *in situ* and instantaneous water-quality sampling, collection of water samples, when water was present either flowing or non-flowing, for laboratory analyses, fish identification and collection, and habitat assessment for each of the nine sites. All field notes and data sheets for this sampling event are provided in Appendix 4. Photographs of the field activities and of individual sites are provided in Appendix 5. Laboratory reports for this sampling event are provided in Appendix 6.

During this event, Sites 2, 3, 4, and 7 were dry. Water-quality sampling, including field measured and laboratory analyzed, and biological sampling were not conducted at these sites since there was no water in the stream channel. The habitat assessment was conducted for each of these sites.

Water-quality sampling, laboratory sampling, habitat assessment and fisheries assessment were completed for Sites 1, 6, 8, and 9. Fish sampling activities were not completed at Site 5 due to an aggressive alligator (the field crew may have stepped on the gator while sampling) present in the sampling reach. The field team conducted boat electrofishing activities at Site 6 and Site 8 for approximately 45 minutes of petal-down time instead of 120 minutes of petal-down time. No fish had been observed within this time span on Mossy Lake. Based on the DO measurements in Mossy Lake, a sustainable fishery is not expected in Mossy Lake. Since the electrofishing ended early on Mossy Lake, an equivalent amount of time was targeted for boat electrofishing activities on Wildcat Lake.

The field team conducted *in situ* water quality sampling, collected samples for laboratory analysis, and habitat assessment for Site 5. Multiple attempts were made to seine the stream; however, due to the large amount of submerged woody debris, the seining was unsuccessful. The field team was then preparing to deploy fyke nets, but an alligator was then observed in the sampling reach. Due to safety concerns, the fyke net was not deployed. Additionally, the fyke

nets were likely to have been unsuccessful because the shallow nature of Coffee Creek at this location would not support proper deployment techniques.

A field blank was not taken.

The Gulf Coast Ecoregion standards for copper and zinc are hardness based standards. During sampling activities, hardness was not sampled; therefore, an accurate evaluation of whether copper and zinc met the Gulf Coast Ecoregion standards could not be made.

Sediment samples were not collected during this field event.

3.1.2 Event 2

Field Event 2 was conducted December 11, 2011 through December 15, 2011. The goals for this event were to conduct *in situ* and instantaneous water quality sampling, collect samples for laboratory analyses, benthic macroinvertebrate collection, sediment sampling, and habitat assessment for each of the nine sites. All field notes and data sheets for this sampling event are provided in Appendix 7. Photographs of the field activities and of individual sites are provided in Appendix 8. Laboratory reports for this sampling event are provided in Appendix 9.

Rainfall during the two weeks prior to the December sampling event contributed to the presence of water at all sites. The Ouachita River was in flood stage at elevations ranging from 56.9 to 66.0 ft NGVD29. During flood stage periods on the Ouachita River the water elevation upstream and downstream from the weir structure on the Felsenthal Dam is equal or the river is in a "free flow" condition. Mossy Lake receives flow from the Ouachita River at an Elevation of 62.4 ft NGVD29 or 65 ft AMSL.

During this event, the field team conducted water quality sampling, laboratory sampling, sediment sampling, habitat assessment and benthic macroinvertebrate collection were completed for Sites 1 through 8. During the event, Site 9 was a part of the Ouachita River and no data were collected at this site. The channel was under approximately 20 ft of the Ouachita River floodwater and was not representative of Coffee Creek.

3.1.3 Event 3

Field Event 3 was conducted May 6, 2012 through May 10, 2012. The goals for this event were to conduct *in situ* and instantaneous water quality sampling, collect samples for laboratory analyses, benthic macroinvertebrate collection, sediment sampling, and habitat assessment for each of the nine sites. All field notes and data sheets for this sampling event are provided in Appendix 10. Photographs of the field activities and of individual sites are provided in Appendix 11. Laboratory reports for this sampling event are provided in Appendix 12.

Rainfall prior to the sampling event and previous flooding of the Ouachita River contributed to the presence of water at Sites 1 through 6, 8, and 9. Prior to the field study, the Ouachita River was above bank full stage from March 14, 2012 to April 26, 2012 at elevations ranging from 65.11 to 72.91 ft NGVD29. During flood stage periods on the Ouachita River, the water elevation upstream and downstream from the weir structure on the Felsenthal Dam is equal or the river is in a "free flow" condition. Mossy Lake receives flow from the Ouachita River at an Elevation of 62.4 ft NGVD29 or 65 ft AMSL.

Site 7 at the designated sampling reach was a dry channel and not sampled during the May 2012 field event. The physical habitat was assessed during the study, but biological and chemical assessments were not conducted.

3.1.4 Event 4

Field Event 4 was conducted August 19, 2012 through August 23, 2012. The goals for this event were to conduct *in situ* and instantaneous water quality sampling, laboratory sampling, fish identification and collection, sediment sampling, and habitat assessment for each of the nine sites. All field notes and data sheets for this sampling event are provided in Appendix 13. Photographs of the field activities and of individual sites are provided in Appendix 14. Laboratory reports for this sampling event are provided in Appendix 15.

During the event, Sites 2, 3, 4, and 7 were dry. Water quality sampling, collection of samples for laboratory analyses and biological sampling were not conducted at these sites since there was no water in the stream channel. A sediment sample was collected and the habitat assessment was performed for each of these sites.

During this event, the water quality samples, collection of samples for laboratory analyses, habitat assessment and fisheries assessment were completed for Sites 1, 5, 6, 8, and 9. The field team at Site 6 and Site 8 used a boat electrofisher for approximately 60 minutes of petal-down time and deployed 2 fyke nets, 2 mini-fyke nets, and an experimental gill net, all net sets were left over night and recovered in the order in which they were placed in the water. The field team at Site 5 deployed one experimental gill net across the entire stream. At Site 1, a backpack electrofisher was used with nets.

Sediment sampling was not conducted at Sites 6 and 8.

3.2 SITE SUMMARIES

3.2.1 Site 1 – Coffee Creek Background 1 Summary

Water was present at this site during all four sample events. The physical, chemical, and biological evaluations were conducted at this site for all four field events.

3.2.1.1 Physical Evaluation

During the four field events, habitat assessments were performed for the UAA at this site using the RBP Low Gradient Habitat Assessment Worksheet. During the events, the habitat parameters evaluated ranged from poor to optimal. However, most of the habitat parameters were classified as marginal or suboptimal.

Epifaunal substrate and available cover were ranked as marginal during the September 2011, December 2011, and August 2012 field events, and suboptimal during the May 2012 field event. The site epifaunal substrate and available cover ranged from a less than desirable habitat with substrate exhibiting signs of frequent disturbance during field events 1, 2, and 4, to exhibiting an adequate habitat for maintenance of populations during the May 2012 field event. The variation observed in the epifaunal substrate and available cover is a reflection of the quantity of water available during the sampling periods.

Pool substrates were classified as marginal during the September 2011, December 2011, and May 2012 events and suboptimal during the August 2012 event. Pool substrates were characterized as being variable in their mud/clay/sand composition and exhibited small quantities of submerged vegetation depending upon the season.

Pool variability was generally poor during the September 2011 field event and classified as suboptimal during the December 2011, May 2012 and August 2012 field events. The pool variability ranged from the majority of the pools small and shallow to the majority of the pools large and deep and was dependent on water availability within the channel.

Sediment deposition was ranked as marginal during the September 2011 and December 2011 field events, optimal during the May 2012 field event, and suboptimal during the August 2012 field event. The sediment deposition ranged from moderate deposition of new gravel, sand or fine sediment on new or old bars to little or no enlargement of islands or point bars.

Channel flow status was ranked poor during the September 2011 field event, with water reaching the base of both lower banks and minimal amount of channel substrate exposed. During the December 2011 and May 2012 events, the channel flow status was ranked suboptimal with water filling greater than 75% of the available channel. During the August 2012 field event, the channel flow status was ranked as marginal, with the water filling 25 – 75% of the available channel.

Channel alteration was classified as optimal during the September 2011, May 2012 and August 2012 field events, and suboptimal during the December 2011 field event. Channel alteration varied from some channelization present to minimal channelization.

Channel sinuosity was classified as suboptimal during the September 2011 and December 2011 field events and optimal during the May 2012 and August 2012 field events. Channel sinuosity varied from the bends in the stream increasing the length of the stream 1 to 2 times longer to the bends in the stream increasing the length of the stream 3 to 4 times longer than if the stream were in a straight line.

Bank stability was ranked as poor during the September 2011 field event, with the banks unstable and obvious bank sloughing present. Bank stability was classified as marginal during the December 2011 and August 2012 field events, with the potential to be moderately unstable with a high erosion potential during floods. During the May 2012 field event, bank stability was classified as suboptimal, with moderately stable banks with small areas of erosion present.

The riparian vegetative zone was ranked primarily as suboptimal during all field events, with the width of the riparian zone 12 meters to 18 meters and exhibiting minimal impacts from human activities. During the September 2011, December 2011, and May 2012 field events, the riparian vegetative zone was ranked as optimal for the right bank, with human activities not impacting the riparian zone, and the width of the riparian zone greater than 18 meters.

3.2.1.2 Chemical Evaluation

During the four field events, laboratory samples and water quality measurements were collected at this site. The results can be found in Table 8.

Color samples ranged from 50 units to 70 units during the four field events. Coffee Creek is currently exempt from the color standards established in Regulation 2.406.

Total solids ranged from 90 mg/L to 170 mg/L. Total dissolved solids (TDS) ranged from 74 mg/L to 120 mg/L. Total suspended solids (TSS) ranged from 8.4 mg/L to 35 mg/L. There are no quantitative standards provided in Regulation 2 for total solids or TSS.

Chloride ranged from 7.3 to 32 mg/L to. The standard for chloride is 33.7 mg/L. Sulfate ranged from 3.1 mg/L to 6.4 mg/L. The standard for sulfate is 56.3 mg/L.

Ortho-phosphate as P ranged from less than 0.02 mg/L to 0.046 mg/L. Total phosphorus ranged from 0.041 mg/L to 0.18 mg/L. Nitrate as N was less than 0.5 mg/L for all events. Fiveday biochemical oxygen demand (BOD₅) ranged from less than 2 mg/L to 6.6 mg/L. There are no quantitative standards provided in Regulation 2 for orthophosphate as P, total phosphorus, nitrate as N, or BOD₅.

Hardness was measured during the December 2011, May 2012, and August 2012 events. Hardness ranged from 27 mg/L to 77 mg/L. There is no quantitative standard for hardness.

Copper ranged from less than 0.006 mg/L to 0.025 mg/L. Zinc ranged from 0.0042 mg/L to 0.0089 mg/L. The standard for copper and zinc are both based on the water hardness; however, Coffee Creek is currently exempt from the metals standards established in Regulation 2, Chapter 5.

Dieldrin was less than 0.020 μ g/L during all four events. Coffee Creek is currently exempt from the dieldrin standard established in Regulation 2, Chapter 5.

Fecal coliform ranged from 34 colony forming units (CFU) /100mL to 950 CFU /100mL. Coffee Creek is currently exempt from the fecal coliform standard established in Regulation 2, Chapter 5.

The temperature instantaneous measurements ranged from 5.92°C to 27.76°C during the four field events. The temperature diurnal measurements ranged from 5.27°C to 25.54°C during the four field events. The maximum allowable temperature standard for the Typical Gulf Coastal Ecoregion is 30°C. This site met the temperature standard during all field events.

The pH instantaneous measurements ranged from 5.68 S.U. to 7.35 S.U during the four field events. The pH diurnal measurements ranged from 6.69 S.U. to 7.13 S.U. during the four field events. The APCEC Regulation No. 2 pH water quality standard for pH is between 6.0 S.U. and 9.0 S.U. This site was below the standard of 6.0 S.U. to 9.0 S.U. for one grab measurement during the August 2012 field event.

Dissolved oxygen instantaneous measurements ranged from 1.11 mg/L to 7.55 mg/L during the four field events. Dissolved oxygen diurnal measurements ranged from 0.0 mg/L to 7.59 mg/L during the four field events. The minimum allowable dissolved oxygen standard for watersheds that are less than 10 mi² for Typical Gulf Coastal Ecoregion is 2 mg/L (critical limit) and 5 mg/L (primary limit). During the September 2011, May 2012, and August 2012 field events, the dissolved oxygen was below the critical limit at least 98% of the time at this site. During the December 2011 field event, however, the dissolved oxygen level was above both the critical and primary limit during the entire field event.

Conductivity instantaneous measurements ranged from 0.085 mS/cm to 0.175 mS/cm during the four field events. Conductivity diurnal measurements ranged from 0.086 mS/cm to 0.184 mS/cm during the four field events. There is no standard for conductivity in the APCEC Regulation No. 2.

Turbidity measurements ranged from 4.6 to 126 NTUs during the four field events. The May 2012 and August 2012 events both had turbidity readings that exceeded the Gulf Coastal Ecoregion Standard of 21 NTUs.

3.2.1.3 Biological Evaluation, Fish Collection

3.2.1.3.1 <u>September 2011, First Fish Event</u>

There were a total of 26 fish specimens representing 3 species collected from the Site 1 pool. Fish collected were identified to the species level, weighed, and a length measurement was taken. All fisheries data collected for this site, including an analysis of the lengths and weights, are presented in Table 9. All three species identifications were verified by a third party biologist, American Aquatics, Inc., as presented in Appendix 16. There were no anomalies observed for any fish collected at this site.

Although water was present in this area of Coffee Creek in the form of a small, shallow pool, no flow was observed within the reach during the time of sampling. This site is located approximately 11.5 miles upstream from the Ouachita River (along Coffee Creek at non-flood stage) and has no record of a flood event which could have deposited these fish. The source of fish specimens collected from pools during the sampling event is most likely Lucas Pond, which is located approximately 3.4 miles upstream from Site 1 on a tributary to Coffee Creek. Storm water events impacting Lucas Pond likely result in fish migrating into this portion of the channel downstream from Lucas Pond. Some fish remain within the channel as it dries out by seeking refuge in the larger pools that are more resistant to drying out.

3.2.1.3.2 <u>August 2012, Second Fish Event</u>

There were a total of 42 fish specimens representing 8 species collected from the Site 1 pool. Fish collected were identified to the species level, weighed, and a length measurement was taken. The dominant fish species collected at this site was bluegill (*Lepomis macrochirus*) with 20 specimens collected and averaging 3.6-g and 70-mm in length. All fisheries data collected for this site, including an analysis of the lengths and weights, is presented in Table 10. All species identifications were verified by a third party biologist, American Aquatics, Inc., as presented in Appendix 16. There were no anomalies observed for any fish collected at this site.

Although water was present in the stream sampling reach, no flow was observed within the reach during the time of sampling. This site is located approximately 11.5 miles upstream from the Ouachita River (along Coffee Creek at non-flood stage) and has no record of a flood event which could have deposited these fish. The source of fish specimens collected from pools during the sampling event is most likely Lucas Pond, which is located approximately 3.4 miles upstream from Site 1 on a tributary to Coffee Creek. Storm water events impacting Lucas Pond likely result in fish migrating into this portion of the channel downstream from Lucas Pond. Some fish remain within the channel as it dries out by seeking refuge in the larger pools that are more resistant to drying out.

3.2.1.4 <u>Biological Evaluation, Benthic Macroinvertebrate Collection</u>

3.2.1.4.1 December 2011, First Benthic Macroinvertebrate Sample Event

The December 2011 Site 1 benthic macroinvertebrate sample analysis resulted in the identification of 194 total specimens. The specimens represent 7 different taxa and were dominated by the highly tolerant family Naididae (Oligochaeta). The dominant functional feeding group for Site 1 was the collector/gatherers and this site exhibited a mean tolerance value of 8.33. The primary reason for the low diversity and high mean tolerance value at Site 1 stems from the ephemeral natural of the stream. Site 1 is subjected to frequent dry periods and likely receives a significant amount of siltation during high rain events, with both factors contributing to a lack of habitat for aquatic macroinvertebrates. Those species recovered at Site 1 represent organisms that are capable of moving in quickly and taking advantage of the short-term, limited habitat resources. No EPT taxa (a metric describing the total number of Ephemeropteran, Plecopteran, and Trichopteran taxa) were collected at Site 1 during the fall sampling event. A summary of all specimens collected at Site 1 during the December 2011 event is provided in Table 11. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.1.4.2 <u>May 2012, Second Benthic Macroinvertebrate Sample Event</u>

The May 2012 Site 1 benthic macroinvertebrate sample analysis resulted in the identification of 200 total specimens. The specimens represent 19 different taxa and were dominated by the highly tolerant family Chironomidae. The dominant functional feeding group for Site 1 was the predators and this site exhibited a mean tolerance value of 7.8. This stream exhibited an increased diversity when compared to what was found during the fall 2011 sampling event and is attributable to recent rainfall. Site 1 is subjected to frequent dry periods and likely receives a significant amount of siltation during high rain events, with both factors contributing to a lack of habitat for aquatic macroinvertebrates. Those species collected at Site 1 represent organisms that are capable of moving in quickly and taking advantage of the short-term, limited habitat resources. One EPT taxa was collected at Site 1 during the spring sampling event. A summary of all specimens collected at Site 1 during the May 2012 event is provided in Table 12. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.2 Site 2 – Coffee Creek Background 2 Summary

Water was present at this site during Events 2 and 3, which followed periods of rain in the basin. Water was not present at this site during Events 1 and 4.

3.2.2.1 Physical Evaluation

During the four field events, the habitat was evaluated for the UAA at this site using the RBP Low Gradient Habitat Assessment Worksheet. During the events, the habitat parameters evaluations ranged from poor to optimal.

At Site 2, epifaunal substrate and available cover were marginal during all four field events. The site exhibited less than desirable quantities of habitat and showed signs of frequent disturbance.

The presence of pools within the stream sampling reach was minimal, but those that were present were marginal in quality. Pool substrate was also marginal in quality and was predominantly all mud/clay or silty/sandy in composition. There was very little submerged vegetation or root mats present. Pool variability within the channel was poor and was primarily a result of the channel exhibiting a poor slope profile. When water is present within the channel at this site, it is concentrated in several small, shallow pools of fairly homogenous depth.

The sampling reach at Site 2 exhibited impacts from sediment deposition within the channel, as indicated by the moderate deposition of new sediment on new or old bars. Stream flow within the channel was poor during all four sampling events. When present, water was mostly present as small, standing pools filling less than 25% of the available channel. Although stream flow was poor, there were obvious signs of poor bank stability and scouring that suggest the channel is affected by fast-moving, high water events.

The channel did not exhibit obvious signs of alteration either from channelization or dredging. The channel sinuosity was optimal and the bends in the stream appeared to increase the length of the stream between 2 to 3 times longer than if the stream were in a straight line.

The riparian vegetative zone was ranked as optimal during all field events, with human activities not impacting the riparian zone, and the width of the riparian zone greater than 18 meters.

3.2.2.2 <u>Chemical Evaluation</u>

During the December 2011 and May 2012 events, laboratory samples and water quality measurements were collected at this site. The results can be found in Table 13.

Color samples ranged from 50 units to 200 units during the four field events. Coffee Creek is currently exempt from the color standards established in Regulation 2.406.

Total solids ranged from 240 mg/L to 400 mg/L. Total dissolved solids (TDS) ranged from 240 mg/L to 300 mg/L. Total suspended solids (TSS) ranged from 5.2 mg/L to 95 mg/L. There are no quantitative standards provided in Regulation 2 for total solids or TSS.

Chloride ranged from 35 mg/L to 42 mg/L. The standard for chloride is 33.7 mg/L. Sulfate ranged from 12 mg/L to 43 mg/L. The standard for sulfate is 56.3 mg/L.

Ortho-phosphate as P ranged from less than 0.02 mg/L to 0.039 mg/L. Total phosphorus ranged from 0.052 mg/L to 0.36 mg/L. Nitrate as N ranged from less than 0.5 mg/L to 0.21 mg/L. Five-day biochemical oxygen demand (BOD₅) ranged from less than 2 mg/L to 9.6 mg/L. There are no quantitative standards provided in Regulation 2 for orthophosphate as P, total phosphorus, nitrate as N, or BOD₅.

Hardness was measured during the December 2011, and May 2012 events. Hardness ranged from 74 mg/L to 140 mg/L. There is no quantitative standard for hardness.

Copper ranged from less than 0.006 mg/L to 0.015 mg/L. Zinc ranged from 0.0059 mg/L to 0.0086 mg/L. The standard for copper and zinc are both based on the water hardness; however, Coffee Creek is currently exempt from the metals standards established in Regulation 2, Chapter 5.

Dieldrin was less than $0.020~\mu g/L$ during all events. Coffee Creek is currently exempt from the dieldrin standard established in Regulation 2, Chapter 5.

Fecal coliform ranged from 57 CFU /100mL to 1,600 CFU /100mL. Coffee Creek is currently exempt from the fecal coliform standard established in Regulation 2, Chapter 5.

The temperature instantaneous measurements ranged from 6.01°C to 26.91°C during the December 2011 and May 2012 field events. The temperature diurnal measurements ranged from 3.86°C to 28.90°C during the December 2011 and May 2012 field events. The maximum allowable temperature standard for the Typical Gulf Coastal Ecoregion is 30°C. This site met the temperature standard during the December 2011 and May 2012 field events.

The pH instantaneous measurements ranged from 6.45 S.U. to 7.52 S.U during the December 2011 and May 2012 field events. The pH diurnal measurements ranged from 6.73 S.U. to 7.12 S.U. during the December 2011 and May 2012 field events. The APCEC Regulation No. 2 pH water quality standard for pH is between 6.0 S.U. and 9.0 S.U. This site met the pH standard during the December 2011 and May 2012 field events.

Dissolved oxygen instantaneous measurements ranged from 1.43 mg/L to 6.84 mg/L during the December 2011 and May 2012 field events. Dissolved oxygen diurnal measurements ranged from 0.0 mg/L to 6.98 mg/L during the December 2011 and May 2012 field events. The minimum allowable dissolved oxygen standard for watersheds that are less than 10 mi² for Typical Gulf Coastal Ecoregion is 2 mg/L (critical limit) and 5 mg/L (primary limit). During the May 2012 field event, the dissolved oxygen was below the critical limit 98% of the time at this

site. During the December 2011 field event, the dissolved oxygen level was above the critical limit during the entire field event.

Conductivity instantaneous measurements ranged from 0.307 mS/cm to 0.564 mS/cm during the December 2011 and May 2012 field events. Conductivity diurnal measurements ranged from 0.307 mS/cm to 0.568 mS/cm during the December 2011 and May 2012 field events. There is no standard for conductivity in the APCEC Regulation No. 2.

Turbidity measurements ranged from 10.0 NTU to 97.6 NTUs during the December 2011 and May 2012 field events. The December 2011 event had a turbidity reading that exceeded the Gulf Coastal Ecoregion Standard of 21 NTUs. The May 2012 event had a turbidity reading that met the standard.

3.2.2.3 <u>Biological Evaluation, Fish Collection</u>

3.2.2.3.1 September 2011, First Fish Event

Water was not present at this site during this sampling event. Therefore, no fish were collected from this site.

3.2.2.3.2 August 2012, Second Fish Event

Water was not present at this site during this sampling event. Therefore, no fish were collected from this site.

3.2.2.4 <u>Biological Evaluation, Benthic Macroinvertebrate Collection</u>

Analyses for the benthic macroinvertebrate data included functional feeding groups (FFG), species abundance and diversity, and species tolerance levels. Functional feeding groups are a classification system based on behavioral mechanisms of food acquisition. The benefit of this method is that macroinvertebrate groups can be studied collectively based on the way they acquire and process energy in their environment. The major FFGs are: scrapers, which scrape algae from rocks and other substrates; collector/gatherers, which collect FPOM from benthic sediments; shredders, which consume the larger CPOM (usually leaf litter); and filterers, which collect FPOM from the water column. Species abundance, the amount or density of a given species per sample unit, was calculated for each sample site. Species diversity, the number of different species represented in a sample of individuals, was also calculated for each sample site. The final benthic macroinvertebrate metric calculated was mean pollution tolerance value (tolerance value). Tolerance values describe how tolerant any given species is to pollution within its habitat. The tolerance value scale goes from 0 to 10. Organisms with low numbers are very sensitive to pollution, while those with tolerance value numbers closer to 10 tolerate more pollution within their habitat. Organisms with tolerance values less than 3 are extremely pollution sensitive, while those with values between 8 and 10 are considered highly tolerant to

heavy pollution levels. All organisms in between 3 and 8 on the tolerance scale are considered intermediate or moderately tolerant to pollution. Results from data analyses are provided below.

3.2.2.4.1 <u>December 2011, First Benthic Macroinvertebrate Sample Event</u>

The December 2011 Site 2 benthic macroinvertebrate sample analyses resulted in the identification of 187 total specimens. The specimens represent 13 different taxa and were dominated by the highly tolerant family Naididae (Oligochaeta). The dominant functional feeding group for Site 2 was the collector/gatherers and this site exhibited a mean tolerance value of 8.04. No EPT were collected at Site 2 during the fall sampling event. A summary of all specimens collected at Site 2 during the December 2011 event is provided in Table 14. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.2.4.2 May 2012, Second Benthic Macroinvertebrate Sample Event

The May 2012 Site 2 benthic macroinvertebrate sample analyses resulted in the identification of 126 total specimens. The specimens represent 13 different taxa and were dominated by the highly tolerant family Chironomidae. The dominant functional feeding group for Site 2 was the collector/gatherers and this site exhibited a mean tolerance value of 8.0. No EPT were collected at Site 2 during the spring sampling event. A summary of all specimens collected at Site 2 during the May 2012 event is provided in Table 15. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.3 Site 3 – Indian Creek Summary

Water was present at this site during Events 2 and 3, which followed periods of rain in the basin. Water was not present at this site during Events 1 and 4.

3.2.3.1 Physical Evaluation

During the four field events, physical habitat was evaluated for the UAA at this site using the RBP Low Gradient Habitat Assessment Worksheet. During the events, the habitat parameters evaluated ranged from poor to optimal.

Epifaunal substrate and available cover at Site 3 were ranked as marginal during the September 2011, December 2011, and August 2012 events and suboptimal during the May 2012 event. The epifaunal substrate and available cover ranged from less than desirable and with the substrate frequently disturbed or removed to the epifaunal substrate and available cover well-suited for full colonization potential and adequate habitat for maintenance of populations.

Stream pools were fairly homogenous and received a low rating for pool variability. There were only a few pools present and they were shallow and homogenous in depth. Pool substrates were characterized as being predominantly mud or sand/silt with little to no root mats or submerged vegetation. Pool variability was also poor to marginal during all four events because the few pools that were present well shallow and exhibited a homogenous depth profile.

Sediment deposition at this site was minimal during all four field events and exhibited little or no enlargement of islands or point bars and with less than 20% of the bottom being affected by sediment deposition. The minimal amount of observed sediment deposition is likely a result of the poor channel flow status. The channel flow status was classified poor during all field events except for the spring 2012 event, where levels were higher as a result of recent rain events and were filling approximately 50% of the available channel.

There were no obvious signs of channel alternation, channelization, or dredging during any of the four field events and the stream exhibited a pattern that is normal for low gradient streams in the region.

The channel at this site was marginally sinuous to suboptimal throughout the study reach with bends increasing the length of the stream from 1 to 2 times longer than if the stream were a straight line.

The stream banks were relatively stable and were ranked as suboptimal to optimal during the four field events. The stream banks did exhibit some small areas of erosion but they showed signs of having healed over. The stream banks did appear stable with little potential for future problems.

The riparian vegetative zone width was classified as optimal during all field events, with a vegetated width greater than 18 meters on both sides of the stream channel. The stream reach did not exhibit any signs of impacts from human activities.

3.2.3.2 Chemical Evaluation

During the December 2011 and May 2012 events, laboratory samples and water quality measurements were collected at this site. The results can be found in Table 16.

Color samples ranged from 120 units to 150 units during the four field events. There is no quantitative standard for color.

Total solids ranged from 200 mg/L to 250 mg/L. Total dissolved solids (TDS) ranged from 140 mg/L to 190 mg/L. Total suspended solids (TSS) ranged from 33 mg/L to 35 mg/L. There are no quantitative standards provided in Regulation 2 for total solids or TSS.

Chloride ranged from 21 mg/L to 23 mg/L. The standard for chloride is 33.7 mg/L. Sulfate ranged from 12 mg/L to 39 mg/L. The standard for sulfate is 56.3 mg/L.

Ortho-phosphate as P ranged from less than 0.02~mg/L to 0.058~mg/L. Total phosphorus ranged from 0.035~mg/L to 0.16~mg/L. Nitrate as N was less than 0.05~mg/L during both events. Five-day biological oxygen demand (BOD₅) ranged from less than 2~mg/L to 4.0~mg/L. There are no quantitative standards provided in Regulation 2 for orthophosphate as P, total phosphorus, nitrate as N, or BOD₅.

Hardness was measured during the December 2011, and May 2012 events. Hardness ranged from 54 mg/L to 57 mg/L. There is no quantitative standard for hardness.

Copper ranged from less than 0.006~mg/L to 0.039~mg/L. Zinc ranged from 0.012~mg/L to 0.018~mg/L. The standard for copper and zinc are both based on the water hardness.

Dieldrin was less than 0.020 $\mu g/L$ during both events. The acute standard for dieldrin is 2.5 $\mu g/L$ and the chronic standard is 0.0019 $\mu g/L$.

Fecal coliform ranged from 4.0 CFU /100mL to 110 CFU /100mL. The standard for secondary contact waters for fecal coliform is a single sample maximum of 2,000 CFU/100 mL.

The temperature instantaneous measurements ranged from 5.71°C to 23.95°C during the December 2011 and May 2012 field events. The temperature diurnal measurements ranged from 4.93°C to 25.01°C during the December 2011 and May 2012 field events. The maximum allowable temperature standard for the Typical Gulf Coastal Ecoregion is 30°C. This site met the temperature standard during the December 2011 and May 2012 field events.

The pH instantaneous measurements ranged from 6.38 S.U. to 6.94 S.U during the December 2011 and May 2012 field events. The pH diurnal measurements ranged from 6.03 S.U. to 6.66 S.U. during the December 2011 and May 2012 field events. The APCEC Regulation No. 2 pH water quality standard for pH is between 6.0 S.U. and 9.0 S.U. This site met the pH standard during the December 2011 and May 2012 field events.

Dissolved oxygen instantaneous measurements ranged from 0.73 mg/L to 3.35 mg/L during the December 2011 and May 2012 field events. Dissolved oxygen diurnal measurements ranged from 0.21 mg/L to 4.98 mg/L during the December 2011 and May 2012 field events. The minimum allowable dissolved oxygen standard for watersheds that are less than 10 mi² for Typical Gulf Coastal Ecoregion is 2 mg/L (critical limit) and 5 mg/L (primary limit). During the December 2011 field event, the dissolved oxygen level was below the critical limit 99% of the time at this site, and during the May 2012 field event, the dissolved oxygen was below the critical limit 75% of the time at this site.

Conductivity instantaneous measurements ranged from 0.177 mS/cm to 0.210 mS/cm during the December 2011 and May 2012 field events. Conductivity diurnal measurements ranged from 0.174 mS/cm to 0.227 mS/cm during the December 2011 and May 2012 field events. There is no standard for conductivity in the APCEC Regulation No. 2.

Turbidity measurements were 13.5 NTUs during both the December 2011 and May 2012 field events. Both turbidity measurements met the Gulf Coastal Ecoregion Standard of 21 NTUs.

3.2.3.3 Biological Evaluation, Fish Collection

3.2.3.3.1 September 2011, First Fish Event

Water was not present at this site during this sampling event. Therefore, no fish were collected from this site.

3.2.3.3.2 <u>August 2012, Second Fish Event</u>

Water was not present at this site during this sampling event. Therefore, no fish were collected from this site.

3.2.3.4 Biological Evaluation, Benthic Macroinvertebrate Collection

Analyses for the benthic macroinvertebrate data included functional feeding groups (FFG), species abundance and diversity, and species tolerance levels. Functional feeding groups are a classification system based on behavioral mechanisms of food acquisition. The benefit of this method is that macroinvertebrate groups can be studied collectively based on the way they acquire and process energy in their environment. The major FFGs are: scrapers, which scrape algae from rocks and other substrates; collector/gatherers, which collect FPOM from benthic sediments; shredders, which consume the larger CPOM (usually leaf litter); and filterers, which collect FPOM from the water column. Species abundance, the amount or density of a given species per sample unit, was calculated for each sample site. Species diversity, the number of different species represented in a sample of individuals, was also calculated for each sample site. The final benthic macroinvertebrate metric calculated was mean pollution tolerance value (tolerance value). Tolerance values describe how tolerant any given species is to pollution within its habitat. The tolerance value scale goes from 0 to 10. Organisms with low numbers are very sensitive to pollution, while those with tolerance value numbers closer to 10 tolerate more pollution within their habitat. Organisms with tolerance values less than 3 are extremely pollution sensitive, while those with values between 8 and 10 are considered highly tolerant to heavy pollution levels. All organisms in between 3 and 8 on the tolerance scale are considered intermediate or moderately tolerant to pollution. Results from data analyses are provided below.

3.2.3.4.1 <u>December 2011, First Benthic Macroinvertebrate Sample Event</u>

The December 2011 Site 3 benthic macroinvertebrate sample analysis resulted in the identification of 176 total specimens. The specimens represent 11 different taxa and were dominated by the highly tolerant family Asellidae (Isopoda). The dominant functional feeding group for Site 3 was the collector/gatherers and this site exhibited a mean tolerance value of 8.04. No EPT were collected at Site 3 during the fall sampling event. A summary of all specimens collected at Site 3 during the December 2011 event is provided in Table 17. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.3.4.2 May 2012, Second Benthic Macroinvertebrate Sample Event

The May 2012 Site 3 benthic macroinvertebrate sample analysis resulted in the identification of 198 total specimens. The specimens represent 17 different taxa and were dominated by the highly tolerant family Asellidae (Isopoda). The dominant functional feeding group for Site 3 was the predators and this site exhibited a mean tolerance value of 8.2. No EPT were collected at Site 3 during the spring sampling event. A summary of all specimens collected at Site 3 during the May 2012 event is provided in Table 18. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.4 Site 4 – Coffee Creek Background 3 Summary

Water was present at this site during Events 2 and 3, which followed periods of rain in the basin. Water was not present at this site during Events 1 and 4.

3.2.4.1 Physical Evaluation

During the four field events, stream habitat was evaluated for the UAA at this site using the RBP Low Gradient Habitat Assessment Worksheet. During the events, overall habitat parameters evaluated ranged from poor to optimal.

Epifaunal substrate and available cover were ranked as marginal during the September 2011, May 2012, and August 2012 events and poor during the December 2011 event. The site epifaunal substrate and available cover ranged from lack of habitat and substrate to less than desirable habitat and the substrate frequently disturbed or removed to the epifaunal substrate.

Pool substrates in the sampling reach were characterized as marginal to suboptimal during the four field events. The pool substrates varied between an all mud or clay or sand bottom with little or no root mat and no submerged vegetation to a mixture of soft sand, mud, or

clay, and some root mats and submerged vegetation present. Pool variability at this stream site was poor and the channel exhibited a homogenous depth profile throughout the sampling reach. The channel was completely dry during two of the four sampling events, and when wetted, the pools present were shallow and homogenous in depth.

Stream sediment deposition was ranked as suboptimal during the September 2011 and December 2011 field events and optimal during the May 2012 and August 2012 field events. This sediment deposition classification indicates that there were signs of some new increase in bar formation and slight deposition in pools but the majority of the reach exhibited little or no enlargement of islands or point bars and with less than 20% of the bottom being affected by sediment deposition.

The channel flow was poor during the September 2011 and August 2012 field events, with very little water in the channel and mostly present as standing pools. During the December 2011 and May 2012 events, channel flow was classified as optimal with the water reaching the base of both lower banks and a with a minimal amount of the channel substrate exposed.

The channel at the stream sampling reach was relatively unaltered and did not exhibit any obvious signs of channelization, dredging, or other alternations to the normal pattern.

Channel sinuosity was ranked as marginal during all four field events with the bends in the stream increasing the length of the stream less than 1 times longer than if the stream were in a straight line. The stream banks were relatively stable and exhibited little potential for future problems. The riparian vegetative zone width was greater than 18 meters and did not show obvious signs of impacts from human activities.

3.2.4.2 Chemical Evaluation

During the December 2011 and May 2012 events, laboratory samples and water quality measurements were collected at this site. The results can be found in Table 19.

Color samples ranged from 100 units to 400 units during the four field events. Coffee Creek is currently exempt from the color standards established in Regulation 2.406.

Total solids ranged from 480 mg/L to 530 mg/L. Total dissolved solids (TDS) ranged from 420 mg/L to 420 mg/L. Total suspended solids (TSS) ranged from 33 mg/L to 60 mg/L. There are no quantitative standards provided in Regulation 2 for total solids or TSS.

Chloride was 47 mg/L during the two sample events. The standard for chloride is 33.7 mg/L. Sulfate ranged from 4.4 mg/L to 150 mg/L. The standard for sulfate is 56.3 mg/L.

Ortho-phosphate as P ranged from less than 0.02~mg/L to 0.18~mg/L. Total phosphorus ranged from 0.030~mg/L to 1.0~mg/L. Nitrate as N ranged from less than 0.5~mg/L to 0.31~mg/L.

Five-day biological oxygen demand (BOD₅) ranged from less than 2 mg/L to 7.3 mg/L. There are no quantitative standards provided in Regulation 2 for orthophosphate as P, total phosphorus, nitrate as N, or BOD₅.

Hardness was measured during the December 2011, and May 2012 events. Hardness ranged from 180 mg/L to 200 mg/L. There is no quantitative standard for hardness.

Copper was less than 0.006 mg/L during the two events. Zinc ranged from 0.0045 mg/L to 0.022 mg/L. The standard for copper and zinc are both based on the water hardness; however, Coffee Creek is currently exempt from the metals standards established in Regulation 2, Chapter 5.

Dieldrin was less than $0.020~\mu g/L$ during all events. Coffee Creek is currently exempt from the dieldrin standard established in Regulation 2, Chapter 5.

Fecal coliform ranged 10 CFU /100mL to 38 CFU /100mL. Coffee Creek is currently exempt from the fecal coliform standard established in Regulation 2, Chapter 5.

The temperature instantaneous measurements ranged from 5.65°C to 23.28°C during the December 2011 and May 2012 field events. The temperature diurnal measurements ranged from 5.74°C to 27.76°C during the December 2011 and May 2012 field events. The maximum allowable temperature standard for the Typical Gulf Coastal Ecoregion is 30°C. This site met the temperature standard during the December 2011 and May 2012 field events.

The pH instantaneous measurements ranged from 6.24 S.U. to 7.24 S.U during the December 2011 and May 2012 field events. The pH diurnal measurements ranged from 6.92 S.U. to 7.91 S.U. during the December 2011 and May 2012 field events. The APCEC Regulation No. 2 pH water quality standard for pH is between 6.0 S.U. and 9.0 S.U. This site met the pH standard during the December 2011 and May 2012 field events.

Dissolved oxygen instantaneous measurements ranged from 0.71 mg/L to 4.33 mg/L during the December 2011 and May 2012 field events. Dissolved oxygen diurnal measurements ranged from 0.00 mg/L to 8.22 mg/L during the December 2011 and May 2012 field events. The minimum allowable dissolved oxygen standard for watersheds that are less than 10 mi² for Typical Gulf Coastal Ecoregion is 2 mg/L (critical limit) and 5 mg/L (primary limit). During the December 2011 field event, the dissolved oxygen level was below the critical limit 13% of the time at this site, and during the May 2012 field event, the dissolved oxygen was below the critical limit 70% of the time at this site.

Conductivity instantaneous measurements ranged from 0.530 mS/cm to 0.645 mS/cm during the December 2011 and May 2012 field events. Conductivity diurnal measurements

ranged from 0.536 mS/cm to 0.649 mS/cm during the December 2011 and May 2012 field events. There is no standard for conductivity in the APCEC Regulation No. 2.

Turbidity measurements ranged from 2.95 NTUs to 16.5 NTUs during the December 2011 and May 2012 field events. Both turbidity measurements met the Gulf Coastal Ecoregion Standard of 21 NTUs.

3.2.4.3 Biological Evaluation, Fish Collection

3.2.4.3.1 September 2011, First Fish Event

Water was not present at this site during this sampling event. Therefore, no fish were collected from this site.

3.2.4.3.2 <u>August 2012, Second Fish Event</u>

Water was not present at this site during this sampling event. Therefore, no fish were collected from this site.

3.2.4.4 Biological Evaluation, Benthic Macroinvertebrate Collection

Analyses for the benthic macroinvertebrate data included functional feeding groups (FFG), species abundance and diversity, and species tolerance levels. Functional feeding groups are a classification system based on behavioral mechanisms of food acquisition. The benefit of this method is that macroinvertebrate groups can be studied collectively based on the way they acquire and process energy in their environment. The major FFGs are: scrapers, which scrape algae from rocks and other substrates; collector/gatherers, which collect FPOM from benthic sediments; shredders, which consume the larger CPOM (usually leaf litter); and filterers, which collect FPOM from the water column. Species abundance, the amount or density of a given species per sample unit, was calculated for each sample site. Species diversity, the number of different species represented in a sample of individuals, was also calculated for each sample site. The final benthic macroinvertebrate metric calculated was mean pollution tolerance value (tolerance value). Tolerance values tell you how tolerant any given species is to pollution within its habitat. The tolerance value scale goes from 0 to 10. Organisms with low numbers are very sensitive to pollution, while those with tolerance value numbers closer to 10 tolerate a lot more pollution within their habitat. Organisms with tolerance values less than 3 are extremely pollution sensitive, while those with values between 8 and 10 are considered highly tolerant to heavy pollution levels. All organisms in between 3 and 8 on the tolerance scale are considered intermediate or moderately tolerant to pollution. Results from data analyses are provided below.

3.2.4.4.1 <u>December 2011, First Benthic Macroinvertebrate Sample Event</u>

The December 2011 Site 4 benthic macroinvertebrate sample analysis resulted in the identification of 198 total specimens. The specimens represent 7 different taxa and were dominated by the highly tolerant family Asellidae (Isopoda). The dominant functional feeding group for Site 4 was the collector/gatherers and this site exhibited a mean tolerance value of 8.36. No EPT taxa were collected at Site 4 during the fall sampling event. A summary of all specimens collected at Site 4 during the December 2011 event is provided in Table 20. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.4.4.2 May 2012, Second Benthic Macroinvertebrate Sample Event

The May 2012 Site 4 benthic macroinvertebrate sample analysis resulted in the identification of 282 total specimens. The specimens represent 10 different taxa and were dominated by the highly tolerant family Chironomidae. The dominant functional feeding group for Site 4 was the collector/gatherers and this site exhibited a mean tolerance value of 8.2. No EPT taxa were collected at Site 4 during the spring sampling event. A summary of all specimens collected at Site 4 during the May 2012 event is provided in Table 21. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.5 Site 5 – Coffee Creek Near Trestle Summary

Water was present at this site during all four sample events.

3.2.5.1 Physical Evaluation

During the four field events, the stream habitat was evaluated for the UAA at this site using the RBP Low Gradient Habitat Assessment Worksheet. During the events, the habitat parameters evaluated ranged from poor to optimal. Most of the habitat parameters were classified as marginal or suboptimal.

Epifaunal substrate and available cover were optimal during the September 2011 field event, marginal during the December 2011 and August 2012 field events, and poor during the May 2012 field event. The site epifaunal substrate and available cover ranged from a lack of stable habitat and unstable substrate during the May 2012 event, to an adequate amount of habitat for maintenance of populations during the December 2011 and August 2012 field events, to an epifaunal substrate and available cover that enables full colonization potential. The variability exhibited at this site is a reflection of the impact of flood waters on this stream reach.

Pool substrates were marginal to suboptimal throughout the four field events. The dominant substrate materials were mud/muck, organic matter, and some root mats and submerged vegetation. Pool variability was marginal to suboptimal and pool depth ranged from predominantly shallow pools to large, deep pools. The stream bed does not exhibit a variable depth profile and depth of the existing pools is dependent upon water level.

Sediment deposition during the four field events was variable and was heavily influenced by recent rainfall and flooding events from the Ouachita River. The sediment deposition ranged from heavy deposits of fine material to some new increase of bar formation.

Channel flow was consistently present throughout the four sampling events and classified as suboptimal to optimal over the course of the study. Stream flow consisting of effluent filled over 75% of the available channel with water during all four field events.

The stream reach did not exhibit obvious signs of physical channel alteration during the September 2011 and December 2011 field events. However, there were signs of channel alteration as a result of inundation from the Ouachita River that manifested during the May 2012 and August 2012 field events. Stream channel sinuosity was marginal at this stream site with the bends in the stream channel increasing the length less than one times long than if it were a straight line.

Stream bank stability was marginal to suboptimal during the four field events. The stream sampling reach is a braided channel in some portions and presented a challenge for the assessment. Stream banks in the riparian zone were well vegetated with bald cypress (*Taxodium distichum*) providing some bank stability. However, many of the braided channels were not as well protected and did show signs of scouring and sloughing.

The overall riparian vegetative zone was classified as optimal as a result of being moderately well vegetated in a variety of tree species, including bald cypress (*Taxodium distichum*) trees that were situated on the water's edge. There were minimal signs of human impacts to the riparian vegetative zone.

3.2.5.2 Chemical Evaluation

During the four field events, laboratory samples and water quality measurements were collected at this site. The results can be found in Table 22.

Color samples ranged from 600 units to 1,500 units during the four field events. Coffee Creek is currently exempt from the color standards established in Regulation 2.406.

Total solids ranged from 1,600 mg/L to 1,800 mg/L. Total dissolved solids (TDS) ranged from 1,300 mg/L to 1,700 mg/L. Total suspended solids (TSS) ranged from 21 mg/L to 180 mg/L. There are no quantitative standards provided in Regulation 2 for total solids or TSS.

Chloride ranged from 170 mg/L to 210 mg/L. The standard for chloride is 33.7 mg/L. Sulfate ranged from 340 mg/L to 380 mg/L. The standard for sulfate is 56.3 mg/L.

Ortho-phosphate as P ranged from 0.15 mg/L to 1.1 mg/L. Total phosphorus ranged from 0.880 mg/L to 2.4 mg/L. Nitrate as N ranged from less than 0.05 mg/L to 0.18 mg/L. Five-day biochemical oxygen demand (BOD₅) ranged from less than 2 mg/L to 46 mg/L. There are no quantitative standards provided in Regulation 2 for orthophosphate as P, total phosphorus, nitrate as N, or BOD₅.

Hardness was measured during the December 2011, May 2012, and August 2012 events. Hardness ranged from 250 mg/L to 290 mg/L. There is no quantitative standard for hardness.

Copper ranged from 0.0084 mg/L to 0.050 mg/L. Zinc ranged from 0.27 mg/L to 0.47 mg/L. The standard for copper and zinc are both based on the water hardness; however, Coffee Creek is currently exempt from the metals standards established in Regulation 2, Chapter 5.

Dieldrin was less than $0.020~\mu g/L$ during all four events. Coffee Creek is currently exempt from the dieldrin standard established in Regulation 2, Chapter 5.

Fecal coliform ranged from less than 1 CFU /100mL to 3,000 CFU /100mL. Coffee Creek is currently exempt from the fecal coliform standard established in Regulation 2, Chapter 5.

The temperature instantaneous measurements ranged from 9.18°C to 33.28°C during the four field events. The temperature diurnal measurements ranged from 9.62°C to 34.90°C during the four field events. The maximum allowable temperature standard for the Typical Gulf Coastal Ecoregion is 30°C. This site exceeded the temperature standard during the September 2011, May 2012, and August 2012 field events.

The pH instantaneous measurements ranged from 7.14 S.U. to 7.79 S.U during the four field events. The pH diurnal measurements ranged from 7.55 S.U. to 8.33 S.U. during the four field events. The APCEC Regulation No. 2 pH water quality standard for pH is between 6.0 S.U. and 9.0 S.U. This site met the standard during all field events.

Dissolved oxygen instantaneous measurements ranged from 0.21 mg/L to 1.47 mg/L during the four field events. Dissolved oxygen diurnal measurements ranged from 0.00 mg/L to 3.88 mg/L during the four field events. The minimum allowable dissolved oxygen standard for watersheds that are greater than 10 mi² for Typical Gulf Coastal Ecoregion is 3 mg/L (critical limit) and 5 mg/L (primary limit). During the September 2011, May 2012, and August 2012 field events, the dissolved oxygen was below the critical limit 100% of the time at this site. During the December 2011 field event, the dissolved oxygen was below the critical limit 88% of the time at this site.

Conductivity instantaneous measurements ranged from 1.87 mS/cm to 2.30 mS/cm during the four field events. Conductivity diurnal measurements ranged from 1.706 mS/cm to 2.468 mS/cm during the four field events. There is no standard for conductivity in the APCEC Regulation No. 2.

Turbidity measurements ranged from 27.2 NTU to 583 NTUs during the four field events. All four field events had turbidity readings that exceeded the Gulf Coastal Ecoregion Standard of 21 NTUs.

3.2.5.3 <u>Biological Evaluation, Fish Collection</u>

3.2.5.3.1 <u>September 2011, First Fish Event</u>

Water was present at Site 5 during the field sampling time period. Attempts were made at seining at this site; however, they were not successful as a result of a large quantity of submerged logs and large woody debris and poor visibility. Backpack electrofishing was not attempted at this site due to limitations on this methodology from the high water conductivity. Additional attempts at seining or fyke net deployment were halted for safety concerns due to the observation of an aggressive alligator within the center of the sampling reach.

3.2.5.3.2 August 2012, Second Fish Event

Water was present at Site 5 during the August 2012 field sampling time period. Attempts were made at seining at this site during previous field events; however, they were not successful as a result of a large quantity of submerged logs and large woody debris and poor visibility. Backpack electrofishing was not attempted at this site due to limitations on this methodology from the high water conductivity. Additional attempts at seining or fyke net deployment were avoided for safety concerns due to the observation of an aggressive alligator within the center of the sampling reach. A final sampling effort was attempted during this field event by deploying an experimental gill net across the channel with the largest bar mesh deployed in the deepest portion of the channel. This effort resulted in the capture of one fish, a shortnose gar (*Lepisosteus platostomus*) weighing in at 758-g and measuring 558-mm in length. This was the only fish captured during any of the field events at Site 5. The fisheries data collected for this site, including the length and weight, are presented in Table 23.

The gill net also captured 2 turtles, one red-eared slider (*Trachemys scripta elegans*) which was promptly released, and one spiny softshell turtle (*Apalone spinifera*) that was already dead upon retrieval of the net. The fish identification at this site was verified by a third party biologist, American Aquatics, Inc., as presented in Appendix 16. There were no anomalies observed for the fish collected at this site.

3.2.5.4 Biological Evaluation, Benthic Macroinvertebrate Collection

3.2.5.4.1 <u>December 2011, First Benthic Macroinvertebrate Sample Event</u>

The December 2011 Site 5 benthic macroinvertebrate sample analysis resulted in the identification of 182 total specimens. The specimens represent 21 different taxa and were dominated by the highly tolerant taxa of Chironomini (Diptera). The dominant functional feeding group for Site 5 was undetermined due to a lack of information on functional feeding group classification for the Chironomini group. The taxa at this site exhibited a mean tolerance value of 8.24. No EPT were collected at Site 5 during the fall sampling event. A summary of all specimens collected at Site 5 during the December 2011 event is provided in Table 24. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.5.4.2 <u>May 2012, Second Benthic Macroinvertebrate Sample Event</u>

The May 2012 Site 5 benthic macroinvertebrate sample analysis resulted in the identification of 51total specimens. The specimens represent 9 different taxa and were dominated by the highly tolerant taxa of Chironomidae (Diptera). The dominant functional feeding group for Site 5 was the predator group. The taxa at this site exhibited a mean tolerance value of 8.0. No EPT were collected at Site 5 during the spring sampling event. A summary of all specimens collected at Site 5 during the May 2012 event is provided in Table 25. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.6 Site 6 – Mossy Lake Summary

Water was present at this site during all four sample events. Prior to the December 2011 and the May 2012 macrobenthos studies, Mossy Lake had been recently flooded by the Ouachita River, but was no longer flooded when the field events took place.

3.2.6.1 Physical Evaluation

During the first field event, the habitat assessment was performed using the RBP Low Gradient Habitat Assessment Worksheet. This form was found to be inadequate for evaluating lake-type habitats such as those found at Mossy Lake and Wildcat Lake. A new evaluation form was chosen and the remaining 3 field events were evaluated utilizing the Lake Habitat Assessment Field Sheet (DEP-SOP-001/01: Form FD 9000-6) developed by the Florida Department of Environmental Protection. Mossy Lake and Wildcat Lake are similar elevation and terrain as many Florida Lakes and swampy, marshy areas.

During all four of the field events, the habitat evaluations for this site were consistently marginal to suboptimal. The hydrologic assessment for Mossy Lake indicated that surface water inflow and outflow present (or outflow only)..." was only due to the Georgia-Pacific inflow or from the Ouachita River flooding Mossy Lake out. The retention time in Mossy Lake varies seasonally. In high water seasons, the retention time is occasionally influenced by the Ouachita River which can reach 20,000 cfs during flooding periods. The Georgia-Pacific flow is about 70 cfs and thus the Georgia Pacific effluent only represents about 0.3% of the flow in the river. The Georgia-Pacific effluent is unmeasurable in the river flow during flooding periods. This reduces residence time of the water in the lake, which is inversely related to the inflow. However, in normal flow conditions, there is only the 70 cfs of inflow from Georgia-Pacific. The residence time of the water inflow into Mossy Lake from Georgia Pacific is around two weeks. There was no natural freshwater inflow into Mossy Lake from Coffee Creek during any of the four study periods. In contrast, Wildcat Lake has continuous inflow from the Ouachita River, but no natural freshwater flow from inflowing streams in the drainage basin of Wildcat Lake occurred during any of the four sampling events.

During the four field events, water color was classified as poor due to reduced visibility in response to color in the water. The Secchi disk readings were consistently classified as poor with visibility well below 1 foot in depth.

Vegetation quality during all events at this site was characterized as sub-optimal. Observed vegetative composition within and surrounding the lake was comprised of mostly native species and with moderate growth (6-20%) of nuisance macrophytes.

Stormwater inputs ranged between marginal and sub-optimal with moderate levels of direct inputs to the lake but with signs of best management practices (BMPs) in place.

The quality of the bottom substrate was consistently poor across all four field events as a result of thick deposits of coarse particulate organic matter (CPOM) and significant quantities of anaerobic mud/muck/silt.

The upland buffer zone was consistently classified as optimal and resulted in minimal impacts from lakeside adverse human alterations. The upland buffer zone was consistently classified as greater than 18-m (59 ft) from the lake with native vegetation between the upland area and the littoral zone. There is minimal human development in the area and there are very few man-made structures or roads adjacent to the lake.

There was evidence for adverse watershed land use in the form of silvicultural practices and industrial operations.

3.2.6.2 Chemical Evaluation

During the four-field events, laboratory samples and water quality measurements were collected at this site. The results can be found in Table 26.

Color samples ranged from 200 units to 1,500 units during the four field events. Mossy Lake is currently exempt from the color standards established in Regulation 2.406.

Total solids ranged from 430 mg/L to 1,800 mg/L. Total dissolved solids (TDS) ranged from 400 mg/L to 1,800 mg/L. Total suspended solids (TSS) ranged from 8.8 mg/L to 22 mg/L. There are no quantitative standards provided in Regulation 2 for total solids or TSS.

Chloride ranged from 46 mg/L to 230 mg/L. The standard for chloride is 33.7 mg/L. Sulfate ranged from 100 mg/L to 460 mg/L. The standard for sulfate is 56.3 mg/L.

Ortho-phosphate as P ranged from 0.2 mg/L to 1.1 mg/L. Total phosphorus ranged from 0.24 mg/L to 1.4 mg/L. Nitrate as N ranged from less than 0.05 mg/L to 0.25 mg/L. Five-day biochemical oxygen demand (BOD₅) ranged from 2.6 mg/L to 110 mg/L. There are no quantitative standards provided in Regulation 2 for orthophosphate as P, total phosphorus, nitrate as N, or BOD₅.

Hardness was measured during the December 2011, May 2012, and August 2012 events. Hardness ranged from 70 mg/L to 290 mg/L. There is no quantitative standard for hardness.

Copper ranged from less than 0.006 mg/L to 0.037 mg/L. Zinc ranged from 0.068 mg/L to 0.26 mg/L. The standard for copper and zinc are both based on the water hardness; however, Mossy Lake is currently exempt from the metals standards established in Regulation 2, Chapter 5.

Dieldrin was less than $0.020~\mu g/L$ during all four events. Mossy Lake is currently exempt from the dieldrin standard established in Regulation 2, Chapter 5.

Fecal coliform ranged from less than 1 CFU /100mL to 1,600 CFU /100mL. Mossy Lake is currently exempt from the fecal coliform standard established in Regulation 2, Chapter 5.

The temperature instantaneous measurements ranged from 6.43 °C to 29.74 °C during the four field events. The temperature diurnal measurements ranged from 6.30 °C to 30.88 °C during the four field events. The maximum allowable temperature standard for the Typical Gulf Coastal Ecoregion is 32 °C. This site met the temperature standard during all field events.

The pH instantaneous measurements ranged from 6.55 S.U. to 10.41 S.U during the four field events. The pH diurnal measurements ranged from 6.42 S.U. to 8.41 S.U. during the four

field events. The APCEC Regulation No. 2 pH water quality standard for pH is between 6.0 S.U. and 9.0 S.U. One grab sample exceeded the standard during the August 2012 field event.

Dissolved oxygen instantaneous measurements ranged from 0.10 mg/L to 7.87 mg/L during the four field events. Dissolved oxygen diurnal measurements ranged from 0.00 mg/L to 8.51 mg/L during the four field events. The minimum allowable dissolved oxygen standard for lakes and reservoirs is 5 mg/L. During the September 2011, May 2012, and August 2012 field events, dissolved oxygen was below the critical limit 100% of the time at this site. During the December 2011 field event, dissolved oxygen was below the critical limit 17% of the time at this site. The May 2012 sampling event followed a flooding event when the Ouachita River did enter the Lake. There is a specific DO standard for the Ouachita River during flooding events that ranges from 3 to 4.5 mg/L following flooding events unless natural conditions cause the DO to be less than 3 mg/L. The Ouachita River during flood events has been found to have DO concentrations in the 1 to 3 mg/L range.

Conductivity instantaneous measurements ranged from 0.608 mS/cm to 2.47 mS/cm during the four field events. Conductivity diurnal measurements ranged from 0.285 mS/cm to 2.560 mS/cm during the four field events. There is no standard for conductivity in the APCEC Regulation No. 2.

Turbidity measurements ranged from 16.1 NTU to 45 NTUs during the four field events. The September 2011 and August 2012 field events had turbidity readings that exceeded the Gulf Coastal Ecoregion Standard of 25 NTUs.

3.2.6.3 <u>Biological Evaluation, Fish Collection</u>

3.2.6.3.1 <u>September 2011, First Fish Event</u>

Site 6 at Mossy Lake was sampled using a boat electrofisher. Areas representative of the overall conditions available within the lake were electrofished for approximately 45 minutes. No fish had been shocked to the surface or observed at all for the duration of the 45-minute sampling effort.

3.2.6.3.2 August 2012, Second Fish Event

Site 6 at Mossy Lake was sampled using multiple methods that included boat electrofishing and the deployment of an experimental gill net, fyke nets, and mini-fyke nets. The boat electrofishing was conducted for 60 minutes of pedal-down time. The sampling efforts during this event resulted in the collection of 4 fish representing 3 species. The mean weight of those fish was 548.0-g and the mean length was 481.8-mm. All four fish were captured using the experimental gill net and the fyke nets. The boat electrofishing was not successful in capturing fish during this field event; however, several gar specimens were observed jumping as a response

to the electrofishing process. This is expected as a result of the high conductivity in Mossy Lake and the inability to effectively transfer 3,000 watts from water to the fish. All fisheries data collected for this site, including an analysis of the lengths and weights, is presented in Table 27.

3.2.6.4 <u>Biological Evaluation, Benthic Macroinvertebrate Collection</u>

3.2.6.4.1 December 2011, First Benthic Macroinvertebrate Sample Event

The December 2011 Site 6 benthic macroinvertebrate sample analysis resulted in the identification of 209 total specimens. The specimens represent 17 different taxa and were dominated by the family Scirtidae (Coleoptera). The dominant functional feeding group for Site 6 was the shredders and this site exhibited a mean tolerance value of 7.65. No EPT were collected at Site 6 during the fall sampling event. A summary of all specimens collected at Site 6 during the December 2011 event is provided in Table 28. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.6.4.2 May 2012, Second Benthic Macroinvertebrate Sample Event

The May 2012 Site 6 benthic macroinvertebrate sample analysis resulted in the identification of 250 total specimens. The specimens represent 24 different taxa and were dominated by the family Chironomidae (Diptera). The dominant functional feeding group for Site 6 was the predators and this site exhibited a mean tolerance value of 8.0. Two EPT taxa were collected at Site 6 during the spring sampling event. A summary of all specimens collected at Site 6 during the May 2012 event is provided in Table 29. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.7 Site 7 – Felsenthal Reference Stream

Water was present at this site during Events 2, which followed a period of rain in the basin. Water was not present at this site during Events 1, 3 and 4.

3.2.7.1 Physical Evaluation

During the four field events, the habitat was evaluated for the UAA at this site using the RBP Low Gradient Habitat Assessment Worksheet. During the events, the habitat parameters evaluations ranged from poor to optimal.

Epifaunal substrate and available cover were classified as suboptimal during the September 2011 and December 2011 events and poor during the May 2012 and August 2012

events. The site epifaunal substrate and available cover ranged from lack of habitat and substrate to the habitat is well suited for full colonization potential and adequate habitat from maintenance of populations.

Pool substrates were classified as marginal to suboptimal and were predominantly all mud or clay with a small quantity of root mats, but with no submerged vegetation present. Pool variability within the channel was generally poor as a result of a lack of variability in the depth profile of the channel. In addition, the absence of water in the channel during all field events also contributed to the lower rating for this parameter.

Sediment deposition within the stream sampling reach was classified as optimal during all four field events and was evidenced by the absence of islands or point bars. Less than 20% of the channel showed any signs of sediment deposition.

Channel flow was classified as poor during the September 2011, May 2012 and August 2012 field events, as a result of the stream channel being completely dry. During the December 2011 event, the channel flow status was ranked optimal with the water reaching the base of both lower banks and a minimal amount of the channel substrate exposed.

The channel at Site 7 did not exhibit any signs of channelization or dredging and had a normal stream pattern. This parameter was expected to be classified as optimal because this is the reference stream and it is protected by its location within the Felsenthal National Wildlife Refuge. Sinuosity of the channel was suboptimal to optimal with bends in the stream increasing the length of the stream from 2 to 4 times longer than if the stream were a straight line.

The riparian vegetative zone was ranked as optimal during the all field events, with human activities not impacting the riparian zone, and the width of the vegetated riparian zone greater than 18 meters. The presence of a large and well-vegetated riparian zone has helped provide bank stability all the channel at Site 7. This site does not exhibit any signs of potential for future problems.

3.2.7.2 Chemical Evaluation

During the December 2011 event, laboratory samples and water quality measurements were collected at this site. The results can be found in Table 30. The color sample result was 150 platinum cobalt units (PCUs) during the December 2011 field event. There is no quantitative standard for color.

The total solids result was 140 mg/L. The total dissolved solids (TDS) result was 130 mg/L. The total suspended solids (TSS) result was 19 mg/L. There are no quantitative standards provided in Regulation 2 for total solids or TSS.

The chloride result was 15 mg/L. The standard for chloride is 33.7 mg/L. The sulfate result was 13 mg/L. The standard for sulfate is 56.3 mg/L.

The ortho-phosphate as P result was less than 0.02 mg/L. The total phosphorus result was 0.024 mg/L. The nitrate as N result was 0.12 mg/L. The five-day biochemical oxygen demand (BOD₅) result was less than 2 mg/L or less than the method detection limit (MDL). There are no quantitative standards provided in Regulation 2 for orthophosphate as P, total phosphorus, nitrate as N, or BOD₅.

Hardness was measured during the December 2011 event. The hardness result was $15 \,$ mg/L. There is no quantitative standard for hardness.

The copper result was less than 0.006 mg/L. The zinc result was 0.016 mg/L. The standard for copper and zinc are both based on the water hardness.

The dieldrin result was less than 0.002 $\mu g/L$. The acute standard for dieldrin is 2.5 $\mu g/L$ and the chronic standard is 0.0019 $\mu g/L$.

The fecal coliform result was 37 colony forming units (CFU)/100 mL. The standard for secondary contact waters for fecal coliform is a single sample maximum of 2,000 CFU/100 mL.

The instantaneous measurements of stream temperature ranged from 4.8°C to 10.23°C during the December 2011 field event. The diurnal stream temperature measurements ranged from 4.20°C to 10.24°C during the December 2011 field event. The maximum allowable temperature standard for the Typical Gulf Coastal Ecoregion is 30°C. This site met the temperature standard during the December 2011 field event.

The pH instantaneous measurements ranged from 5.53 S.U. to 6.22 S.U during the December 2011 field event. The pH diurnal measurements ranged from 4.95 S.U. to 5.23 S.U. during the December 2011 field event. The APCEC Regulation No. 2 pH water quality standard for pH is between 6.0 S.U. and 9.0 S.U. This site was below the pH standard during the December 2011 field event.

Dissolved oxygen instantaneous measurements ranged from 2.48 mg/L to 6.82 mg/L during the December 2011 field event. Dissolved oxygen diurnal measurements ranged from 0.03 mg/L to 1.90 mg/L during the December 2011 field event. The discrepancy between the two instruments may be due to the depth of water present in the pool. The mini-Sonde has a narrower diameter and had a layer of water of at least an inch over the sonde. The Quanta's sensor has a larger diameter and was close to being out of the water. The stirrer on the Quanta's sensor may have been aerating the water in the area of the sensor by spinning too close to the water surface. The minimum allowable dissolved oxygen standard for watersheds that are less than 10 mi² for Typical Gulf Coastal Ecoregion is 2 mg/L (critical limit) and 5 mg/L (primary

limit). During the December 2011 field event, the dissolved oxygen level was below the critical limit 100% of the time at this site.

Conductivity instantaneous measurements ranged from 0.093 mS/cm to 0.106 mS/cm during the December 2011 field event. Conductivity diurnal measurements ranged from 0.090 mS/cm to 0.127 mS/cm during the December 2011 field event. There is no standard for conductivity in the APCEC Regulation No. 2.

The turbidity measurement was 9.95 NTUs during the December 2011 field event. The turbidity measurement met the Gulf Coastal Ecoregion Standard of 21 NTUs.

3.2.7.3 Biological Evaluation, Fish Collection

3.2.7.3.1 September 2011, First Fish Event

Water was not present at this site during this sampling event. Therefore, no fish were collected from this site.

3.2.7.3.2 <u>August 2012, Second Fish Event</u>

Water was not present at this site during this sampling event. Therefore, no fish were collected from this site.

3.2.7.4 Biological Evaluation, Benthic Macroinvertebrate Collection

3.2.7.4.1 December 2011, First Benthic Macroinvertebrate Sample Event

The December 2011 Site 7 benthic macroinvertebrate sample analysis resulted in the identification of 209 total specimens. The specimens represent 6 different taxa and were dominated by the highly tolerant family Asellidae (Caecidotea). The dominant functional feeding group for Site 7 was the collector/gatherers and this site exhibited a mean tolerance value of 8.04. No EPT were collected at Site 7 during the fall sampling event. A summary of all specimens collected at Site 7 during the December 2011 event is provided in Table 31. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.7.4.2 May 2012, Second Benthic Macroinvertebrate Sample Event

Water was not present at this site during this sampling event. Therefore, no benthic macroinvertebrates were collected from this site.

3.2.8 Site 8 – Wildcat Lake Summary

Water was present at Wildcat Lake during all four sample events. Wildcat Lake is a part of the Felsenthal Reservoir system created by Felsenthal Lock & Dam. It is directly connected to the Ouachita River year-round, which is unlike Mossy Lake which is only periodically connected to the Ouachita River when the river is in flood stage.

3.2.8.1 Physical Evaluation

During the first field event, the habitat assessment was performed using the RBP Low Gradient Habitat Assessment Worksheet. This form was found to be inadequate for evaluating lake-type habitats such as those found at Mossy Lake and Wildcat Lake. A new evaluation form was chosen and the remaining 3 field events were evaluated utilizing the Lake Habitat Assessment Field Sheet (DEP-SOP-001/01: Form FD 9000-6) developed by the Florida Department of Environmental Protection.

During all four of the field events, the habitat evaluations for this site were consistently suboptimal to optimal. The hydrologic assessment for Wildcat Lake indicated some signs of surface water inflow were present but that those were not likely a frequent occurrence. The site exhibited a medium to long water retention time which is seasonally impacted by the Ouachita River.

During the four field events, water color was classified as sub-optimal to optimal. The Secchi disk readings were consistently sub-optimal with visibility less than 2.5 feet deep, primarily since this area is still swamp-like except for dilution from the Ouachita River.

Vegetation quality during all events at this site was characterized as optimal. Observed vegetative composition was comprised of a diverse group of native species of aquatic vegetation and terrestrial vegetation.

Stormwater inputs ranged between sub-optimal and optimal with stormwater entering the system via sheet flow over non-cultivated land.

The quality of the bottom substrate was consistently optimal across all four field events with a diverse mixture of sand, detritus, and small quantities of CPOM.

The upland buffer zone was consistently classified as optimal and resulted in minimal impacts from lakeside adverse human alterations. The upland buffer zone was consistently classified as greater than 18-m from the lake with native vegetation between the upland area and the littoral zone. There is minimal human development in the area and there are very few manmade structures or roads adjacent to the lake.

There was no evidence for adverse watershed land use and the watershed is protected as part of the Felsenthal National Wildlife Refuge.

3.2.8.2 Chemical Evaluation

During the four field events, laboratory samples and water quality measurements were collected at this site. The results can be found in Table 32.

Color samples ranged from 30 PCUs to 100 PCUs during the four field events. There is no quantitative standard for color.

Total solids ranged from 76 mg/L to 110 mg/L. Total dissolved solids (TDS) ranged from 40 mg/L to 77 mg/L. Total suspended solids (TSS) ranged from 9.6 mg/L to 16 mg/L. There are no quantitative standards provided in Regulation 2 for total solids or TSS.

Chloride ranged from 4.8 mg/L to 10 mg/L. The standard for chloride is 33.7 mg/L. Sulfate ranged from 6.6 mg/L to 9.1 mg/L. The standard for sulfate is 56.3 mg/L.

Ortho-phosphate as P ranged from less than 0.02~mg/L to 0.026~mg/L. Total phosphorus ranged from 0.03~mg/L to 0.084~mg/L. Nitrate as N ranged from less than 0.05~mg/L to 0.34~mg/L. BOD₅ ranged from less than 2.0~mg/L to 2.5~mg/L. There are no quantitative standards provided in Regulation 2 for orthophosphate as P, total phosphorus, nitrate as N, or BOD₅.

Hardness was measured during the December 2011, May 2012, and August 2012 events. Hardness ranged from 16.0 mg/L to 23.0 mg/L. There is no quantitative standard for hardness.

Copper ranged from less than 0.006~mg/L to 0.039~mg/L. Zinc ranged from 0.0041~mg/L to 0.0075~mg/L. The standard for copper and zinc are both based on the water hardness.

Dieldrin was less than 0.020 $\mu g/L$ during all four events. The acute standard for dieldrin is 2.5 $\mu g/L$ and the chronic standard is 0.0019 $\mu g/L$.

Fecal coliform ranged from 6.0 CFU /100mL to 200 CFU /100mL. The standard for secondary contact waters for fecal coliform is a single sample maximum of 400 CFU/100 mL.

The temperature instantaneous measurements ranged from 7.25°C to 29.48°C during the four field events. The temperature diurnal measurements ranged from 7.08°C to 31.55°C during the four field events. The maximum allowable temperature standard for the Typical Gulf Coastal Ecoregion is 32°C. This site met the temperature standard during all field events.

The pH instantaneous measurements ranged from 6.38 S.U. to 7.54 S.U during the September 2011, December 2011, and August 2012 field events. The pH diurnal measurements ranged from 6.24 S.U. to 7.76 S.U. during the September 2011, December 2011, and August

2012 field events. The APCEC Regulation No. 2 pH water quality standard for pH is between 6.0 S.U. and 9.0 S.U. This site met the temperature standard during the September 2011, December 2011, and August 2012 field events. During the May 2012 field event, no diurnal pH data were collected due to instrument malfunction.

Dissolved oxygen instantaneous measurements ranged from 4.59 mg/L to 9.38 mg/L during the four field events. Dissolved oxygen diurnal measurements ranged from 0.44 mg/L to 9.90 mg/L during the four field events. The minimum allowable dissolved oxygen standard for lakes and reservoirs is 5 mg/L. During the September 2011 field event, the dissolved oxygen measured by the Sonde was below the critical limit 46% of the time at this site. However, none of the grab measurements were below the standard. The discrepancy between the two instruments may be due to the depth of the measurements. The sonde was deployed at a depth of 3 feet, which may have caused it to come into contact with the bottom sediments of the lake or it may have been influenced by potential sediment oxygen demand. The Quanta measurements were collected at a depth of 1 foot, and did not reflect the measurements taken by the Sonde. During subsequent field events, the sensor on the Sonde was deployed at a depth of 1 foot. During the December 2011, May 2012, and August 2012 field events, dissolved oxygen met the standard 100% of the time at this site.

Conductivity instantaneous measurements ranged from 0.066 mS/cm to 0.097 mS/cm during the four field events. Conductivity diurnal measurements ranged from 0.061 mS/cm to 0.095 mS/cm during the four field events. There is no standard for conductivity in the APCEC Regulation No. 2. However, the conductivity measurements indicate that the water in Wildcat Lake is primarily fresh water with low salt content.

Turbidity measurements ranged from 10.8 NTUs to 28.5 NTUs during the four field events. The September 2011 field event had a turbidity reading that exceeded the Gulf Coastal Ecoregion Standard of 25 NTUs. The December 2011, May 2012, and August 2012 field events had turbidity readings that met the Gulf Coastal Ecoregion Standard of 25 NTUs.

3.2.8.3 <u>Biological Evaluation, Fish Collection</u>

3.2.8.3.1 <u>September 2011, First Fish Event</u>

Site 8 at Wildcat Lake was successfully sampled using a boat electrofisher. Areas representative of the overall conditions available within the lake were electrofished for approximately 45 minutes. Sampling was limited to 45 minutes in order to provide a strong and statistically sound comparison to Mossy Lake (Site 6) which was 45 minutes. Habitats sampled were representative of the conditions in Wildcat Lake and similar in composition to those habitats sampled in Mossy Lake.

Unlike Mossy Lake, Wildcat Lake is directly connected to the Ouachita River year-round both upstream and downstream from the sampling site. These access points provide an easy means of fish migration between the Ouachita River and Wildcat Lake.

There were a total of 111 fish specimens collected from Wildcat Lake, representing fourteen species and with a mean weight of 199.4-g and mean length of 180.4-mm, as presented in Table 33. All species identifications were verified by a third party biologist at American Aquatics, Inc., as presented in Appendix 16. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Mr. Fred Heitman of American Aquatics, Inc. A summary by species of fisheries sampling data for this event is presented in Table 33. There were no anomalies observed for any fish collected at this site.

3.2.8.3.2 August 2012, Second Fish Event

Site 8 at Wildcat Lake was successfully sampled using boat electrofishing, experimental gill net deployment, and fyke net and mini-fyke net deployment. Areas representative of the overall conditions available within the lake were electrofished for approximately 60 minutes. Sampling was limited to 60 minutes in order to provide a strong and statistically sound comparison to Mossy Lake (Site 6) which was 60 minutes. Habitats sampled were representative of the conditions in Wildcat Lake and similar in composition to those habitats sampled in Mossy Lake.

Wildcat Lake is directly connected to the Ouachita River both upstream and downstream from the sampling site. These access points provide an easy means of fish migration between the Ouachita River and Wildcat Lake.

There were a total of 160 fish specimens collected from Wildcat Lake, representing 17 species and with a mean weight of 264.2-g and mean length of 170.9-mm, as presented in Table 34. All species identifications were verified by a third party biologist at American Aquatics, Inc., as presented in Appendix 16. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Mr. Fred Heitman of American Aquatics, Inc. A summary by species of fisheries sampling data for this event is presented in Table 34. There were no anomalies observed for any fish collected at this site.

3.2.8.4 <u>Biological Evaluation, Benthic Macroinvertebrate Collection</u>

3.2.8.4.1 December 2011, First Benthic Macroinvertebrate Sample Event

The December 2011 Site 8 benthic macroinvertebrate sample analysis resulted in the identification of 235 total specimens. The specimens represent 16 different taxa and were dominated by the highly tolerant family Naididae (Oligochaeta). The dominant functional feeding group for Site 8 was the collector/gatherers and this site exhibited a mean tolerance value

of 8.33. A total of three different EPT taxa were collected at Site 8 during the fall sampling event. A summary of all specimens collected at Site 8 during the December 2011 event is provided in Table 35. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.8.4.2 May 2012, Second Benthic Macroinvertebrate Sample Event

The May 2012 Site 8 benthic macroinvertebrate sample analysis resulted in the identification of 297 total specimens. The specimens represent 23 different taxa and were dominated by the tolerant family Dytiscidae (Coleoptera), and were primarily all adult specimens. The dominant functional feeding group for Site 8 was the predators and this site exhibited a mean tolerance value of 8.0. One EPT taxa (A metric describing the total number of Ephemeropteran, Plecopteran, and Trichopteran taxa) was collected at Site 8 during the spring sampling event. A summary of all specimens collected at Site 8 during the May 2012 event is provided in Table 36. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.2.9 Site 9 – Coffee Creek Downstream from Mossy Lake Summary

Water was present at this site during all four sample events; however, during Event 2, the site was flooded by the Ouachita River and inaccessible to the field team. The physical, chemical and biological evaluation for Site 9 was not completed during Event 2.

3.2.9.1 <u>Physical Evaluation</u>

During the September 2011, May 2012, and August 2012 field events, the habitat was evaluated for the UAA at this site using the RBP Low Gradient Habitat Assessment Worksheet. During the three field events, the habitat parameters evaluations ranged from marginal to optimal. Most of the habitat parameters were evaluated as suboptimal.

The epifaunal substrate and available cover were ranked as optimal during the three field events that the site was evaluated. Greater than 50% of the substrate was favorable for epifaunal colonization, with a mix of snags, submerged logs, undercut banks, cobble or other stable habitat, and at quantities sufficient enough to allow full colonization potential.

The pool substrates were ranked as suboptimal during the three events, with the pool substrate characterized as a mixture of soft sand, mud, or clay, and some root mats and submerged vegetation present. Pool variability was also ranked as suboptimal with the majority of the pools large and deep and very few shallow pools.

Sediment deposition was ranked as suboptimal to optimal throughout the four field events with some increases in new bar formation, 20-50% of the bottom affected, and slight deposition in pools. Channel flow during the study was consistently classified as optimal to suboptimal with water filling more than 75% of the channel at all times and with minimal quantities of substrate exposed.

The stream channel at Site 9 was classified as suboptimal for alternation and exhibited minimal signs of channelization which occurred at the outfall from Mossy Lake into Coffee Creek. Stream channel sinuosity was classified as suboptimal with the bends in the stream channel increasing the length 1 to 2 times longer than if the channel were a straight line.

Bank stability at Site 9 was classified as marginal to optimal and depended on the time of the year of the sampling event. As a result of overbank flooding from the Ouachita River, the stream reach does have some impacts to the stream channels during portions of the year. However, during non-flood periods, the stream banks are stable and well anchored by a riparian vegetation zone that is classified as suboptimal. The riparian zone is sufficient in width and moderate in vegetation density. There were minimal impacts from human activities within the riparian zone.

3.2.9.2 Chemical Evaluation

During the September 2011, May 2012, and August 2012 field events, laboratory samples and water quality measurements were collected at this site. The results can be found in Table 37.

Color samples ranged from 500 units to 1,500 units during the three field events. Coffee Creek is currently exempt from the color standards established in Regulation 2.406.

Total solids ranged from 890 mg/L to 1,900 mg/L. Total dissolved solids (TDS) ranged from 870 mg/L to 1,800 mg/L. Total suspended solids (TSS) ranged from 10 mg/L to 23 mg/L. There are no quantitative standards provided in Regulation 2 for total solids or TSS.

Chloride ranged from 100 mg/L to 230 mg/L. The standard for chloride is 33.7 mg/L. Sulfate ranged from 180 mg/L to 460 mg/L. The standard for sulfate is 56.3 mg/L.

Ortho-phosphate as P ranged from 0.25 mg/L to 1.2 mg/L. Total phosphorus ranged from 0.690 mg/L to 1.4 mg/L. Nitrate as N was less than 0.5 mg/L for all three events. BOD₅ ranged from 7.2 mg/L to 89 mg/L. There are no quantitative standards provided in Regulation 2 for orthophosphate as P, total phosphorus, nitrate as N, or BOD₅.

Hardness was measured during the May 2012 event and the August 2012 event. Hardness ranged from 160 mg/L to 280 mg/L. There is no quantitative standard for hardness.

Copper ranged from less than 0.006 mg/L to 0.041 mg/L. Zinc ranged from 0.14 mg/L to 0.88 mg/L. The standard for copper and zinc are both based on the water hardness; however, Coffee Creek is currently exempt from the metals standards established in Regulation 2, Chapter 5.

Dieldrin was less than $0.020~\mu g/L$ during all three events. Coffee Creek is currently exempt from the dieldrin standard established in Regulation 2, Chapter 5.

Fecal coliform ranged from less than 1 CFU /100mL to 400 CFU /100mL. Coffee Creek is currently exempt from the fecal coliform standard established in Regulation 2, Chapter 5.

The temperature instantaneous measurements ranged from 24.2°C to 29.75°C during the September 2011, May 2012 and August 2012 field events. The temperature diurnal measurements ranged from 23.15°C to 32.86°C during the September 2011, May 2012 and August 2012 field events. The maximum allowable temperature standard for the Typical Gulf Coastal Ecoregion is 30°C. This site exceeded the temperature standard during the May 2012 field event.

The pH instantaneous measurements ranged from 6.80 S.U. to 8.08 S.U during the September 2011, May 2012 and August 2012 field events. The pH diurnal measurements ranged from 7.64 S.U. to 8.31 S.U. during the September 2011, May 2012 and August 2012 field events. The APCEC Regulation No. 2 pH water quality standard for pH is between 6.0 S.U. and 9.0 S.U. This site met the standard during the September 2011, May 2012 and August 2012 field events.

Dissolved oxygen instantaneous measurements ranged from 2.88 mg/L to 4.64 mg/L during the September 2011, May 2012 and August 2012 field events. Dissolved oxygen diurnal measurements ranged from 2.45 mg/L to 5.03 mg/L during the four field events. The minimum allowable dissolved oxygen standard for watersheds that are greater than 10 mi² for Typical Gulf Coastal Ecoregion is 3 mg/L (critical limit) and 5 mg/L (primary limit). During the September 2011 and May 2012 field event, the dissolved oxygen was above the critical limit 100% of the time at this site. During the August 2012 field event, the dissolved oxygen was below the critical limit 29% of the time at this site.

Conductivity instantaneous measurements ranged from 1.232 mS/cm to 2.48 mS/cm during the September 2011, May 2012 and August 2012 field events. Conductivity diurnal measurements ranged from 1.220 mS/cm to 2.528 mS/cm during the September 2011, May 2012 and August 2012 field events. There is no standard for conductivity in the APCEC Regulation No. 2.

Turbidity measurements ranged from 15 NTU to 68.7 NTUs during the September 2011, May 2012 and August 2012 field events. The September 2011 and August 2012 events had turbidity readings that exceeded the Gulf Coastal Ecoregion Standard of 21 NTUs.

3.2.9.3 Biological Evaluation, Fish Collection

3.2.9.3.1 <u>September 2011, First Fish Event</u>

The high conductivity of this stream reach prevented the use of the backpack electrofisher; therefore sampling was conducted by seining. The presence of underwater debris required multiple passes in each area sampled. Seining was conducted in 4 locations and included multiple habitat types. Three seining passes were made in each location due to the presence of submerged, large woody debris. Seining was halted for safety concerns when multiple water moccasins (*Agkistrodon piscivorus*) were observed in the sampling reach. However, the area that was sampled successfully was representative of all available habitats.

There were a total of 4 fish specimens collected from Site 9, representing three species as presented in Table 38. All species identifications were verified by a third party biologist at American Aquatics, Inc., and found to be in agreement with the exception of the identification Bantum sunfish (*Lepomis symmetricus*), and shortnose gar (*Lepisosteus platostomus*). Our ichthyologist defers to the identifications made by American Aquatics, Inc. The identifications by American Aquatics are: Bantum sunfish as bluegill (*Lepomis macrochirus*) and the shortnose gar as longnose gar (*Lepisosteus osseus*). There were no anomalies observed for any fish collected at this site.

3.2.9.3.2 August 2012, Second Fish Event

The high conductivity of this stream reach prevented the use of the backpack electrofisher; and in the previous field event sampling was conducted by seining. During this field event the sampling methodology was modified to include the use of fyke nets and mini-fyke nets. A total of four nets were deployed over net and recovered the following morning, in the order in which they were deployed. Three of the four nets resulted in fish captures.

There were a total of 8 fish specimens collected from Site 9, representing 5 species as presented in Table 39. The mean weight for all fish collected at Site 9 was 289.3-g and the mean length was 257.7-mm. All species identifications were verified by a third party biologist at American Aquatics, Inc., and found to be in agreement. There was one anomaly observed at this site for the yellow bullhead (*Ameiurus natalis*), which had a broken left barbel and likely occurred as a result of capture in the fyke net.

3.2.9.4 Biological Evaluation, Benthic Macroinvertebrate Collection

3.2.9.4.1 December 2011, First Benthic Macroinvertebrate Sample Event

This portion of Coffee Creek was inundated by the Ouachita River during the time of this sampling event. As it was part of the Ouachita River, the Coffee Creek reach was inaccessible. No sampling was conducted at this station during this event.

3.2.9.4.2 <u>May 2012, Second Benthic Macroinvertebrate Sample Event</u>

The May 2012 Site 9 benthic macroinvertebrate sample analysis resulted in the identification of 259 total specimens. The specimens represent 16 different taxa and were dominated by the highly tolerant taxa of Chironomini (Diptera). The dominant functional feeding group for Site 9 was the predator group. The taxa at this site exhibited a mean tolerance value of 7.8. Two EPT taxa were collected at Site 9 during the spring sampling event with a total abundance of EPT's of 85 specimens. A summary of all specimens collected at Site 9 during the May 2012 event is provided in Table 40. All species identifications were verified by a third party macroinvertebrate taxonomic expert, Dr. John Wojtowicz, as presented in Appendix 17. Where discrepancies occurred, the AquAeTer biologist deferred to the identifications given by Dr. John Wojtowicz.

3.3 SITE COMPARISONS

3.3.1 Comparison of Reference and Background Streams to Coffee Creek

A comparison of the water quality results from the reference stream and the results from the other stream sites during the September 2011 sampling event is presented in Table 41. A comparison of the habitat and biological results from the reference stream and the results from the other stream sites during the September 2011 sampling event is presented in Table 42. No water was present in the Reference Stream at Site 7 or at Sites 2, 3, or 4 in Coffee and Indian Creek and therefore no fish or water quality information was collected. The remaining sampling locations, Site 1 and Site 9, did have water present and were evaluated according to the relevant portions of the AquAeTer work plan, unless stated otherwise in this document. Physiologically, Sites 1 and 7 are both similar based on watershed size, stream gradient, and other physical habitat characteristics. However, they did differ significantly in the presence and quantity of habitat available for sustainment of fisheries populations. Site 9 is located downstream of Sites 4, 5, and 6, all of which are influenced by the presence of the mill. In the absence of the mill, Site 9 would most closely resemble Sites 4 or 5 and would likely be a dry channel at the location where stream sampling was conducted.

A comparison of the water quality results from the reference stream and the results from the other stream sites during the December 2011 sampling event is presented in Table 43. A comparison of the habitat and biological results from the reference stream and the results from the other stream sites during the December 2011 sampling event is presented in Table 44. Water was present at all sites. Coffee Creek downstream from Mossy Lake was part of the Ouachita River during this event and stream sampling was not feasible. Habitat assessment scores and percent comparability to the reference stream were similar between all stream sites evaluated and was directly related to the presence of water in all stream sampling locations during this field event. Benthic macroinvertebrate communities at all background streams were similar in

abundance, diversity, functional feeding group dominance, and pollution tolerance levels to the community found at Site 7, the reference stream.

A comparison of the water quality results from the reference stream and the results from the other stream sites during the May 2012 sampling event is presented in Table 45. A comparison of the habitat and biological results from the reference stream and the results from the other stream sites during the May 2012 sampling event is presented in Table 46. Water was present at all sites except Site 7. The absence of water at Site 7 had an effect on the percent comparability for habitat assessment scores and resulted in Site 4 having the same score as Site 7. Habitat assessment scores were similar between all sites with the exception of Site 2 and Site 5 which had significantly lower scores as a result of poor epifaunal substrate and improper pool variability or substrate composition. Benthic macroinvertebrate communities at Sites 1, 2, 3, 4, 5, and 9 were similar in species diversity, functional feeding group dominance, and pollution tolerance. However, Sites 2 and 5 exhibited significantly lower abundance values than the other background streams. Site 7 was a dry channel and prevented sampling for benthic macroinvertebrates; therefore no direct comparisons are possible for the background sites and Site 7.

A comparison of the water quality results from the reference stream and the results from the other stream sites during the August 2012 sampling event is presented in Table 47. A comparison of the habitat and biological results from the reference stream and the results from the other stream sites during the August 2012 sampling event is presented in Table 48. No water was present in the Reference Stream at Site 7 or at Sites 2, 3, or 4 in Coffee and Indian Creeks and therefore fish sampling was not possible for those locations. Fish samples were collected from Site 1, Site 5, and from Site 9. Site 1 exhibited a significantly higher specimen abundance and species diversity than any of the other stream sites. This is likely attributable to the channel morphology created by heavy sediment deposition which created a series of deep pools that serve as refuge habitat. Site 1 was dominated by small fish species like mosquitofish (Gambusia affinis) and juvenile sunfish (Lepomis spp.), while Site 5 and 9 exhibited much larger species of fish, like spotted gar (Lepisosteus oculatus) or freshwater drum (Aplodinotus grunniens). Habitat assessment scores and percent comparability to the reference stream were similar between Sites 1, 2, 3, 4, and 5 and each of these sites was similar to Site 7, the reference stream. Site 9, however, exhibited much higher habitat score and was ranked higher than the reference stream at Site 7, primarily because the reference stream score was lower due to the absence of water during this field event.

3.3.2 Comparison of Reference Lake and Mossy Lake

A comparison of the water quality results from Wildcat Lake and the results from Mossy Lake during the September 2011 sampling event is presented in Table 49. A comparison of the habitat and biological results from Wildcat Lake and the results from Mossy Lake during the

September 2011 sampling event is presented in Table 50. Water was present at both sites. However, the water present in Wildcat Lake was from the Ouachita River, with very little to no inflow from tributaries. The water present in Mossy Lake was essentially Georgia-Pacific's treated effluent, except for the May 2012 macrobenthos study which was conducted a few days after the Ouachita River elevations and receded from Mossy Lake. Mossy Lake becomes part of the Ouachita River when the River elevation exceeds Elevation 62.4 ft NGVD29. Most sites on Coffee Creek can become part of the Ouachita River with historic water level elevations on the River reaching as high as 88 ft NGVD29. Water conductivity at Site 6 was substantially higher than that of Site 8, thus preventing successful boat electrofishing. Site 8, Wildcat Lake, was successfully electrofished by boat during the first field event and resulted in the collection of a representative sample of the fisheries population in the lake. Site 6 at Mossy Lake was electrofished by boat but did not yield any fish captures as a result of the elevated conductivity in the water. Habitat assessments conducted on both lakes yielded significantly different scores with Site 8 at Wildcat Lake receiving a score of 212 out of a possible 220 points. Site 6 at Mossy Lake received a score of 80 out of the total 220 points and was therefore only 38% comparable to the reference lake. This is a result of very low scoring of Mossy Lake on several key parameters of the habitat assessment. However, the Low Gradient Habitat Assessment sheet from the EPA RBP was determined to be inappropriate for the lake habitats and was replaced for the remaining field sampling events. Using the FDEP lake habitat evaluation sheet, Wildcat Lake had a total score ranging from 100 to 114 out of a total score of 120. Using the same evaluation sheet for Mossy Lake, a total score ranging from 59 to 74 out of 120 was calculated. The Secchi Disk score was not included for either lake due the high color and turbidity in both lakes.

A comparison of the water quality results from Wildcat Lake and the results from Mossy Lake during the December 2011 sampling event is presented in Table 51. A comparison of the habitat and biological results from Wildcat Lake and the results from Mossy Lake during the December 2011 sampling event is presented in Table 52. Water was present at both sites. Benthic macroinvertebrate communities were similar in abundance and species diversity at both lakes; however, they differed in functional feeding group dominance and dominant species. Although both lakes exhibited diverse populations, Mossy Lake was dominated by beetles from the Scirtidae family, while Wildcat Lake was dominated by the Naididae family of Oligochaeta. Habitat assessments were conducted using a different lake assessment form that was developed by the Florida Department of Environmental Protection and that is more targeted at wetland/lake habitats. Habitat scores were significantly different with the percent comparability score for Mossy Lake being 52.6% comparable to the score at Wildcat Lake. The differences in the scores were primarily the result of the absence of aquatic vegetation at Mossy Lake and lower quality bottom substrate material at Mossy Lake when compared to that of Wildcat Lake.

A comparison of the water quality results from Wildcat Lake and the results from Mossy Lake during the May 2012 sampling event is presented in Table 53. A comparison of the habitat and biological results from Wildcat Lake and the results from Mossy Lake during the May 2012

sampling event is presented in Table 54. Water was present at both sites. Habitat assessments of both lakes resulted in a percent comparability of 63.0% for Mossy Lake. This was a result of poor water clarity and poor bottom substrate quality in Mossy Lake. The benthic macroinvertebrate community was similar in density, species diversity, functional feeding group dominance, and mean tolerance values between the two lakes. Mossy Lake was dominated by the highly tolerant group Chironomidae (Diptera), while Wildcat Lake was dominated by the aggressive predatory beetle group Dytiscidae.

A comparison of the water quality results from Wildcat Lake and the results from Mossy Lake during the August 2012 sampling event is presented in Table 55. A comparison of the habitat and biological results from Wildcat Lake and the results from Mossy Lake during the August 2012 sampling event is presented in Table 56. Water was present at both sites. Habitat assessments of both lakes resulted in a percent comparability of 59.0% for Mossy Lake. This was the result of poor water clarity and poor bottom substrate quality in Mossy Lake. As a result of the elevated conductivity in Mossy Lake, an adjustment was made to the sampling methodology. Both lakes were boat electrofished for the same pedal-down time, but additional net sampling was performed in order to ensure that a thorough assessment was conducted on Mossy Lake. The adjusted sampling methodology produced 4 fish from Mossy Lake that represented 3 different species, all of which are adapted to living in conditions similar to those found in Mossy Lake. Wildcat Lake exhibited a significantly higher specimen density at 160 fish from over 17 different taxa. Wildcat Lake fish samples were dominated by bluegill (Lepomis macrochirus), while Mossy Lake was dominated by the more tolerant spotted gar (Lepisosteus oculatus). Mossy Lake was occupied by fish species that can tolerate the lower dissolved oxygen levels that were observed during all four of the field events.

While Wildcat Lake was chosen for its similarity in appearance to Mossy Lake for this study, it was later determined that this did not represent a suitable reference lake for Mossy Lake. The direct connection of Wildcat Lake to the Ouachita River was determined to be constant and Wildcat Lake is a part of the Ouachita River/Felsenthal Reservoir system year-round and not just during flooding events. Mossy Lake, with or without the Georgia-Pacific effluent, would not have the Ouachita River flowing through it year-round and thus cannot be expected to attain the same biological diversity that exists in Wildcat Lake. Without the treated effluent, water would not be present year-round in Mossy Lake. If the weir-gate control structure were not present, Ouachita River water could only back into the lowest elevations of Mossy Lake to a very limited degree.

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LIST OF TABLES

Table Number	er <u>Table Title</u>	Page Number
Table 1	Taxonomic Level of Identification	83
Table 2	Sampling Overview	84
Table 3	Laboratory Handling and Analysis	
Table 4	Sampling Times for Event 1	87
Table 5	Sampling Times for Event 2	
Table 6	Sampling Times for Event 3	89
Table 7	Sampling Times for Event 4	90
Table 8	Water Quality and Chemical Analyses Results for Site 1	91
Table 9	September 2011 Fish Sample Summary for Site 1	
Table 10	August 2012 Fish Sample Summary for Site 1	
Table 11	December 2011 Benthic Macroinvertebrate Sample Summary for Si	
Table 12	May 2012 Benthic Macroinvertebrate Sample Summary for Site 1	
Table 13	Water Quality and Chemical Analyses Results for Site 2	
Table 14	December 2011 Benthic Macroinvertebrate Sample Summary for Si	
Table 15	May 2012 Benthic Macroinvertebrate Sample Summary for Site 2	
Table 16	Water Quality and Chemical Analyses Results for Site 3	
Table 17	December 2011 Benthic Macroinvertebrate Sample Summary for Si	
Table 18	May 2012 Benthic Macroinvertebrate Sample Summary for Site 3	
Table 19	Water Quality and Chemical Analyses Results for Site 4	
Table 20	December 2011 Benthic Macroinvertebrate Sample Summary for Si	
Table 21	May 2012 Benthic Macroinvertebrate Sample Summary for Site 4	
Table 22	Water Quality and Chemical Analyses Results for Site 5	
Table 23	August 2012 Fish Sample Summary for Site 5	
Table 24	December 2011 Benthic Macroinvertebrate Sample Summary for Si	
Table 25	May 2012 Benthic Macroinvertebrate Sample Summary for Site 5	
Table 26	Water Quality and Chemical Analyses Results for Site 6	
Table 27	August 2012 Fish Sample Survey for Site 6	
Table 28	December 2011 Benthic Macroinvertebrate Sample Summary for Si	
Table 29	May 2012 Benthic Macroinvertebrate Sample Summary for Site 6	
Table 30	Water Quality and Chemical Analyses Results for Site 7	
Table 31	December 2011 Benthic Macroinvertebrate Sample Summary for Si	
Table 32	Water Quality and Chemical Analyses Results for Site 8	
Table 33	September 2011 Fish Sample Survey for Site 8	
Table 34	August 2012 Fish Sample Survey for Site 8	
Table 35	December 2011 Benthic Macroinvertebrate Sample Summary for Si	
Table 36	May 2012 Benthic Macroinvertebrate Sample Summary for Site 8	
Table 37	Water Quality and Chemical Analyses Results for Site 9	
Table 38	September 2011 Fish Sample Survey for Site 9	
Table 39	August 2012 Fish Sample Survey for Site 9	
Table 40	May 2012 Benthic Macroinvertebrate Sample Summary for Site 9	
Table 41	Water Quality Comparison of the Stream sites to the Reference Stre	
	September 2011 Event	_

Table 42	Habitat and Biological Comparison of the Stream sites to the Reference Stream
	during the September 2011 Event125
Table 43	Water Quality Comparison of the Stream sites to the Reference Stream during the
	December 2011 Event
Table 44	Habitat and Biological Comparison of the Stream sites to the Reference Stream
	during the December 2011 Event127
Table 45	Water Quality Comparison of the Stream sites to the Reference Stream during the
	May 2012 Event
Table 46	Habitat and Biological Comparison of the Stream sites to the Reference Stream
	during the May 2012 Event129
Table 47	Water Quality Comparison of the Stream sites to the Reference Stream during the
	August 2012 Event
Table 48	Habitat and Biological Comparison of the Stream sites to the Reference Stream
	during the August 2012 Event131
Table 49	Water Quality Comparison of Mossy Lake to the Reference Lake during the
	September 2011 Event
Table 50	Habitat and Biological Comparison of Mossy Lake to the Reference Lake during
	the September 2011 Event133
Table 51	Water Quality Comparison of Mossy Lake to the Reference Lake during the
	December 2011 Event
Table 52	Habitat and Biological Comparison of Mossy Lake to the Reference Lake during
	the December 2011 Event135
Table 53	Water Quality Comparison of Mossy Lake to the Reference Lake during the May
	2012 Event
Table 54	Habitat and Biological Comparison of Mossy Lake to the Reference Lake during
	the May 2012 Event
Table 55	Water Quality Comparison of Mossy Lake to the Reference Lake during the
	August 2012 Event
Table 56	Habitat and Biological Comparison of Mossy Lake to the Reference Lake during
	the August 2012 Event

TABLE 1. TAXANOMIC LEVEL OF IDENTIFICATION

TAXONOMIC LEVEL	GROUPS
Genus	Plecoptera, Ephemeroptera,
	Odonata, Trichoptera,
	Megaloptera, Neuroptera,
	Lepidoptera, Coleoptera,
	Hemiptera, Diptera (in part),
Tribe	Chironominae
Family	Diptera (in part), Crustacea,
	Mollusca
Order	Other non-insect groups

TABLE 2. SAMPLING OVERVIEW

STATION NO.	LOCATIONS NAME	NOTES	WATER QUALITY SAMPLING	LABORATORY SAMPLING	HABITAT ASSESSMENT	
1	Coffee Creek Background 1		Sept 2011, Dec 2011, May 2012, & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	
2	Coffee Creek Background 2	No water during Sept 2011 and Aug 2012 events	Dec 2011 & May 2012	Dec 2011 & May 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	
3	Indian Creek	No water during Sept 2011 and Aug 2012 events	Dec 2011 & May 2012	Dec 2011 & May 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	
4	Coffee Creek Background 3	No water during Sept 2011 and Aug 2012 events	Dec 2011 & May 2012	Dec 2011 & May 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	
5	Coffee Creek Near Trestle	Alligator present during study prevented completion of fish sampling during Sept 2011 event	Sept 2011, Dec 2011, May 2012, & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	
6	Mossy Lake		Sept 2011, Dec 2011, May 2012, & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	
7	Felsenthal Reference Stream	No water during Sept 2011, May 2012 and Aug 2012 events	Dec 2011	Dec 2011	Sept 2011, Dec 2011, May 2012, & Aug 2012	
8	Wildcat Lake		Sept 2011, Dec 2011, May 2012, & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	
9	Coffee Creek Below Mossy Lake	Site was inaccessible due to Ouachita flooding during the Dec 2011 event	Sept 2011, May 2012, & Aug 2012	Sept 2011, May 2012, & Aug 2012	Sept 2011, May 2012, & Aug 2012	

TABLE 2. SAMPLING OVERVIEW

STATION NO.	LOCATIONS NAME	MACRO BENTHOS	FISH	ANALYTICAL	SEDIMENT SAMPLING
1	Coffee Creek Background 1	Dec 2011 & May 2012	Sept 2011 & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	Dec 2011, May 2012, & Aug 2012
2	Coffee Creek Background 2	Dec 2011 & May 2012		Dec 2011 & May 2012	Dec 2011, May 2012, & Aug 2012
3	Indian Creek	reek Dec 2011 & May 2012 De		Dec 2011 & May 2012	Dec 2011, May 2012, & Aug 2012
4	Coffee Creek Background 3	Dec 2011 & May 2012		Dec 2011 & May 2012	Dec 2011, May 2012, & Aug 2012
5	Coffee Creek Near Trestle	Dec 2011 & May 2012	Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	Dec 2011, May 2012, & Aug 2012
6	Mossy Lake	Dec 2011 & May 2012	Sept 2011 & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	Dec 2011 & May 2012
7	Felsenthal Reference Stream	Dec 2011		Dec 2011	Dec 2011, May 2012, & Aug 2012
8	Wildcat Lake	Dec 2011 & May 2012	Sept 2011 & Aug 2012	Sept 2011, Dec 2011, May 2012, & Aug 2012	Dec 2011 & May 2012
9	Coffee Creek Below Mossy Lake	May 2012	Sept 2011 & Aug 2012	Sept 2011, May 2012, & Aug 2012	Dec 2011, May 2012, & Aug 2012

TABLE 3. LABORATORY HANDLING AND ANAYLSIS

PARAMETER	METHOD	HOLDING TIME	MATRIX	CONTAINER / VOLUME	PRESERVATION	
Copper	EPA 200.8	6 months				
Zinc	EPA 200.8	6 months	Water	Plastic / 500 mL	Wet ice 4 °C	
Hardness	SM2340 B	180days				
Total Phosphorus	SM 4500-P B, F	28 days	Water	Plastic / 500 mL	Sulfuric acid, Wet ice 4 °C	
Dieldrin	EPA 608	7 days	Water	3 Glass / 500 mL	Wet ice 4 °C	
Fecal Coliform	SM 9222D	6 hours*	Water	Plastic / 100 mL	Sodium Thiosulfate, Wet ice 4 °C	
BOD_5	SM 5210 B	48 Hours				
Chloride	EPA 300.0	48 Hours	1			
Nitrate as N	EPA 300.0	48 Hours	1			
Orthophosphate as P	SM 4500-P B, F	48 Hours	1			
Color	SM 2120B	48 Hours	Water	Plastic / 0.5 gallon	Wet ice 4 °C	
TDS	SM 2540C	7 days	1			
TSS	USGS 3765	NA	1			
Total Solids	SM 2540B	7 days	1			
Sulfate	EPA 300.0	48 Hours				

^{*} The holding time for the August 2012 sample event was 8 hours due to a change in the laboratory method.

TABLE 4. SUMMARY OF DATES FOR EVENT 1

SITE	SONDE/MI	NI-SONDE	WATER	FECAL	
	FIRST- RECORDED EVENT	LAST RECORDED EVENT	SAMPLE	COLIFORM SAMPLE	
Site 1	9/11/2011 16:30	9/12/2011 7:45	9/13/2011 17:54	9/15/2011 7:04	
Site 2	No Water	No Water	No Water	No Water	
Site 3	No Water	No Water	No Water	No Water	
Site 4	No Water	No Water	No Water	No Water	
Site 5	9/12/2011 10:30	9/14/2011 11:30	9/14/2011 9:32	9/14/2011 10:28	
Site 6	9/12/2011 16:45	9/14/2011 14:15	9/12/2011 13:59	9/12/2011 8:42	
Site 7	No Water	No Water	No Water	No Water	
Site 8	9/11/2011 16:00	9/15/2011 7:00	9/13/2011 15:20	9/15/2011 7:21	
Site 9	9/12/2011 8:30	9/14/2011 14:00	9/12/2011 16:51	9/12/2011 8:30	

TABLE 5. SUMMARY OF DATES FOR EVENT 2

SITE	SONDE/MI	NI-SONDE	WATER	FECAL
	FIRST- RECORDED EVENT	LAST RECORDED EVENT	SAMPLE	COLIFORM SAMPLE
Site 1	12/11/2011 15:45	12/14/2011 14:00	12/12/2011 14:33	12/12/2011 9:56
Site 2	12/11/2011 14:00	12/14/2011 10:00	12/12/2011 16:18	12/12/2011 9:40
Site 3	12/11/2011 14:00	12/14/2011 9:45	12/13/2011 15:33	12/12/2011 8:48
Site 4	12/11/2011 14:00	12/14/2011 9:00	12/14/2011 8:30	12/12/2011 8:07
Site 5	12/11/2011 14:15	12/13/2011 14:45	12/13/2011 13:10	12/13/2011 10:06
Site 6	12/11/2011 14:00	12/14/2011 10:00	12/13/2011 8:35	12/13/2011 9:15
Site 7	12/11/2011 14:00	12/14/2011 15:00	12/12/2011 13:04	12/12/2011 10:20
Site 8	12/11/2011 14:00	12/14/2011 10:45	12/12/2011 9:00	12/14/2011 11:01
Site 9	Flooded	Flooded	Flooded	Flooded

TABLE 6. SUMMARY OF DATES FOR EVENT 3

SITE	SONDE/MI	INI-SONDE	WATER	FECAL	
	FIRST- RECORDED EVENT	LAST RECORDED EVENT	SAMPLE	COLIFORM SAMPLE	
Site 1	5/6/2012 18:45	5/9/2012 11:30	5/8/2012 15:21	5/8/2012 10:30	
Site 2	5/6/2012 18:15	5/9/2012 11:00	5/8/2012 16:40	5/8/2012 10:15	
Site 3	5/6/2012 19:00	5/9/2012 10:30	5/7/2012 15:30	5/7/2012 10:23	
Site 4	5/7/2012 9:45	5/9/2012 9:15	5/9/2012 9:07	5/7/2012 9:26	
Site 5	5/6/2012 18:13	5/8/2012 17:43	5/7/2012 14:15	5/7/2012 10:10	
Site 6	5/6/2012 16:30	5/8/2012 17:30	5/7/2012 9:46	5/7/2012 8:07	
Site 7	No Water	No Water	No Water	No Water	
Site 8	5/6/2012 16:45	5/9/2012 11:30	5/8/2012 7:59	5/9/2012 11:36	
Site 9	5/6/2012 16:58	5/8/2012 17:43	5/7/2012 10:24	5/7/2012 8:14	

TABLE 7. SUMMARY OF DATES FOR EVENT 4

SITE	SONDE/MI	NI-SONDE	WATER	FECAL	
	FIRST- RECORDED EVENT	LAST RECORDED EVENT	SAMPLE	COLIFORM SAMPLE	
Site 1	8/19/2012 18:45	8/22/2012 14:45	8/20/2012 14:50	8/20/2012 10:57	
Site 2	No Water	No Water	No Water	No Water	
Site 3	No Water	No Water	No Water	No Water	
Site 4	No Water	No Water	No Water	No Water	
Site 5	8/19/2012 17:00	8/22/2012 8:30	8/22/2012 8:00	8/20/2012 10:15	
Site 6	8/19/2012 16:45	8/23/2012 7:30	8/20/2012 11:13	8/20/2012 7:55	
Site 7	No Water	No Water	No Water	No Water	
Site 8	8/20/2012 18:15	8/23/2012 11:30	8/23/2012 11:33	8/23/2012 11:33	
Site 9	8/19/2012 17:00	8/23/2012 9:00	8/23/2012 9:04	8/20/2012 8:07	

TABLE 8. WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR SITE 1

PARAMETER	UNITS	PRIMARY STANDARD	CRITICAL STANDARD	SUMMER 2011 COFFEE CREEK, BACKGROUND 9/11 - 9/15, 2011	FALL 2011 COFFEE CREEK, BACKGROUND 12/11 - 12/15, 2011	SPRING 2012 COFFEE CREEK, BACKGROUND 5/6 - 5/10, 2012	SUMMER 2012 COFFEE CREEK, BACKGROUND 8/19 - 8/23, 2012
				40			* 0
Color	Units	-	-	60	50	70	50
Total Solids	(mg/L)	-	-	160	90	170	170
Total Dissolved Solids	(mg/L)	-	-	120	74	110	120
Total Suspended Solids	(mg/L)	-	-	11	8.4	32	35
Ortho-Phosphate as P	(mg/L)	-	1	0.031	0.02	0.046	< 0.02
Total Phosphorus	(mg/L)	-	-	0.18	0.041	0.14	0.063
BOD_5	(mg/L)	-	-	6.6	< 2	2.5	2.1
Copper	(mg/L)	Exempt	Exempt	< 0.006	< 0.006	0.025, 0.013	< 0.006
Zinc	(mg/L)	Exempt	Exempt	0.0042	0.0066	0.0080, 0.0089	0.0086
Chloride	(mg/L)	33.7	-	3.2	7.3	3.5	4.6
Hardness as CaCO3	(mg/L)	-	-	-	27	59, 53	77
Nitrate as N	(mg/L)	-	-	< 0.05	< 0.05	< 0.5	< 0.05
Sulfate	(mg/L)	56.3	-	6.4	6.3	3.1	3.5
Dieldrin	(µg/L)	Exempt	Exempt	< 0.002	< 0.002	< 0.020	< 0.020
Fecal Coliform	CFU/100mL	-	Exempt	800	64	34	950
Dissolved Oxygen - Grab	(mg/L)	> 5.0	> 2.0	1.39 - 3.76	6.51 - 7.55	1.51 - 3.92	1.11 - 2.17
Dissolved Oxygen - Diurnal	(mg/L)	> 5.0	> 2.0	0.0 - 2.83	5.90 - 7.59	0.00 - 1.67	0.21 - 2.66
Dissolved Oxgen - % below acute standard	%	-	-	98%	0%	100%	99%
Temperature - Grab	(°C)	-	< 30	22.45 - 24.17	5.92 - 7.15	22.82 - 27.76	23.96 - 25.04
Temperature - Diurnal	(°C)	-	< 30	20.89 - 21.78	5.27 - 9.85	22.65 - 25.54	22.67-25.06
Conductivity - Grab	(mS/cm)	-	-	0.147 - 0.150	0.085 - 0.093	0.143 - 0.153	0.108 - 0.175
Conductivity - Diurnal	(mS/cm)	-	-	0.146 - 0.184	0.086 - 0.094	0.143 - 0.153	0.174 - 0.178
pH - Grab	(s.u.)	-	6.0 - 9.0	6.70 - 6.98	6.39 - 7.35	6.20 - 7.06	5.68 - 5.35
pH - Diurnal	(s.u.)	-	6.0 - 9.0	6.69 - 6.78	7.00 - 7.09	7.03 - 7.13	7.05-7.12
Turbidity - Grab	(ntu)	-	< 21	4.60	9.79	26.6	126
	1 ' '						

TABLE 9. SEPTEMBER 2011 FISH SAMPLE SUMMARY FOR SITE 1

COMMON	SCIENTIFIC	COUNT	,	VEIGHT		TOTAL LENGTH		
NAME	NAME		MIN.	AVG.	MAX.	MIN.	AVG.	MAX.
			(g)	(g)	(g)	(mm)	(mm)	(mm)
Mississippi silvery minnow	Hybognathus nuchalis	13	0.1	0.2	0.5	57	66	70
bluegill	Lepomis macrochirus	2	0.1	3.1	6.0	59	71	82
mosquitofish	Gambusia affinis	11	0.0	0.0	0.3	24	33	56

Data has been verified in the laboratory of the Brentwood office by Misty Huddleston, Aquatic Biologist

Voucher samples sent to American Aquatics for verification of identifications.

^{*}Cells with empty values did not have a sample size sufficient enough to determine means, minimums, or maximums.

TABLE 10. AUGUST 2012 FISH SAMPLE SUMMARY FOR SITE 1 $\,$

COMMON	SCIENTIFIC	SPECIMEN	WE	GHT	TOTAL LENGTH		
NAME	NAME	COUNT	MIN.	MIN. AVG.		AVG.	MAX.
			(g)	(g)	(mm)	(mm)	(mm)
black bullhead	Ameiurus melas	1		15.0		117.0	
warmouth	Lepomis gulosus	1		22.0		98.0	
green sunfish	Lepomis cyanellus	1		20.0		112.0	
creek chubsucker	Eriomyzon oblongus	3	20.0	59.7	106.0	115.3	126.0
mosquitofish	Gambusia affinis	3	NA	NA	20.0	30.3	38.0
largemouth bass	Micropterus salmoides	3	10.0	15.3	65.0	99.3	124.0
Emerald shiner	Notropis atherinoides	10	2.0	6.1	656.0	73.4	84.0
bluegill	Lepomis macrochirus	20	4.0	11.8	23.0	58.4	100.0

NA indicates specimens that were too small to register a weight.

Data has been verified in the laboratory of the Brentwood office by Misty Huddleston, Aquatic Biologist

Voucher samples sent to American Aquatics for verification of identifications.

*Cells with empty values did not have a sample size sufficient enough to determine means, minimums, or maximums.

TABLE 11. DECEMBER 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 1.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	11	8	Collector/Gather	Unknown
CLADOCERA	LTLP		23	8	Collector/Filter	Unknown
COLLEMBOLA	SMINTHURIDAE	LTLP	1	U	Collector/Gather	Unknown
DIPTERA	TIPULIDAE	LIMONIA	1	10	Shredder	Burrower
ISOPODA	ASELLIDAE	CAECIDOTEA	31	7.7	Collector/Gather	Unknown
OLIGOCHAETA	NAIDIDAE	LTLP	126	10	Collector/Gather	Unknown
MOLLUSCA	CORBICULIDAE	LTLP	126	10	Collector/Gather	Unknown

TABLE 12. MAY 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 1

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
COL FORTER A	DVTICCIDAE	CODTOTOMIC	4	0	DD	CWHAMED
COLEOPTERA	DYTISCIDAE	COPTOTOMUS	4	9	PR	SWIMMER
COLEOPTERA	DYTISCIDAE	NEOPORUS	28	UN	PR	SWIMMER
OLIGOCHAETA	NAIDIDAE	LTLP	35	10	CG	UN
AMPHIPODA	GAMMARIDAE	GAMMARUS	43	6.9	OM	UN
DIPTERA	CHAOBORIDAE	CHAOBORUS	8	8.5	PR	SPRAWLER
COPEPODA	LTLP		3	UN	UN	UN
ODONATA	COENAGRIONIDAE	ENALLAGMA	4	9	PR	CLIMBER
DIPTERA	CHIRONOMIDAE	CHIRONOMINAE	62	6.5	UN	UN
COLEOPTERA	DYTISCIDAE	DYTISCUS	1	5	PR	SWIMMER
EPHEMEROPTERA	LEPTOPHLEBIIDAE	LTLP	3	6.4	CG	SPRAWLER
COLEOPTERA	SCIRTIDAE	SCIRTES	1	7	SH	CLIMBER
HIRUDINEA	LTLP		1	8.9	PAR	CLINGER
CLADOCERA	LTLP		1	8	CF	UN
HEMIPTERA	CORIXIDAE	PALMACORIXA	1	9	PR	SWIMMER
ISOPODA	ASELLIDAE		1	7.7	CG	UN
ODONATA	LIBELLULIDAE	SYPETRUM	1	7.3	PR	CLIMBER
HEMIPTERA	BELOSTOMATIDAE	BELOSTOMA	1	9.8	PR	CLIMBER
GASTROPODA	HYDROBIIDAE		1	6.5	SC	UN
VENEROIDA	SPHAERIDAE		1	7	CG	UN

TABLE 13. WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR SITE 2

PARAMETER	UNITS	PRIMARY STANDARD	CRITICAL STANDARD	SUMMER 2011 COFFEE CREEK, BACKGROUND 2 9/11 - 9/15, 2011	FALL 2011 COFFEE CREEK, BACKGROUND 2 12/11 - 12/15, 2011	SPRING 2012 COFFEE CREEK, BACKGROUND 2 5/6 - 5/10, 2012	SUMMER 2012 COFFEE CREEK, BACKGROUND 2 8/19 - 8/23, 2012
Color	Units	_		No Water	50	200	No Water
Total Solids		-	-	No Water No Water	240	400	No Water No Water
Total Dissolved Solids	(mg/L)	-	-	No Water No Water	240	300	No Water No Water
	(mg/L)	-	-				
Total Suspended Solids	(mg/L)	-	-	No Water	5.2	95	No Water
Ortho-Phosphate as P	(mg/L)	-	-	No Water	< 0.02	0.039	No Water
Total Phosphorus	(mg/L)	-	-	No Water	0.052	0.36	No Water
BOD_5	(mg/L)	-	-	No Water	< 2	9.6	No Water
Copper	(mg/L)	Exempt	Exempt	No Water	< 0.006	0.015	No Water
Zinc	(mg/L)	Exempt	Exempt	No Water	0.0086, 0.0064	0.0059	No Water
Chloride	(mg/L)	33.7	-	No Water	42	35	No Water
Hardness as CaCO3	(mg/L)	-	-	No Water	79, 74	140	No Water
Nitrate as N	(mg/L)	-	-	No Water	0.21	< 0.5	No Water
Sulfate	(mg/L)	56.3	-	No Water	43	12	No Water
Dieldrin	(µg/L)	Exempt	Exempt	No Water	< 0.0020	< 0.020	No Water
Fecal Coliform	CFU/100mL	-	Exempt	No Water	100, 57	1600	No Water
Dissolved Oxygen - Grab	(mg/L)	> 5.0	> 2.0	No Water	6.22 - 6.84	1.43 - 1.91	No Water
Dissolved Oxygen - Diurnal	(mg/L)	> 5.0	> 2.0	No Water	4.97 - 6.98	0.00 - 2.66	No Water
Dissolved Oxgen - % below acute standard	%	-	-	No Water	0%	98%	No Water
Temperature - Grab	(°C)	_	< 30	No Water	6.01 - 9.33	21.60 - 26.91	No Water
Temperature - Diurnal	(°C)	-	< 30	No Water	3.86 - 9.30	21.05 - 28.90	No Water
Conductivity - Grab	(mS/cm)	-	-	No Water	0.307 - 0.564	0.470 - 0.478	No Water
Conductivity - Diurnal	(mS/cm)	-	_	No Water	0.307 - 0.568	0.457 - 0.478	No Water
pH - Grab	(s.u.)	-	6.0 - 9.0	No Water	6.45 - 7.52	6.48 - 6.80	No Water
pH - Diurnal	(s.u.)	-	6.0 - 9.0	No Water	6.73 - 7.12	7.01 - 7.30	No Water
Turbidity - Grab	(ntu)	-	< 21	No Water	10.0	97.6	No Water
	(/		. = -	- 19 11			2.10

TABLE 14 DECEMBER 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 2

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
A A ADMINOD A	CD ANGONIVOTED A F	CD ANGONAY	1	0	GG	IDI
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	1	8	CG	UN
COPEPODA	CLADOCERA	LTLP	1	8	CF	UN
COLEOPTERA	HALIPLIDAE	PELTODYTES	2	8.5	SH	UN
COLEOPTERA	DYTISCIDAE	NEOPORUS	2	UN	PR	SWIMMER
COLLEMBOLA	SMINTHURIDAE	LTLP	1	UN	CG	SKATER
DIPTERA	CHIRONOMIDAE	CHIRONOMINI	36	6.5	UN	UN
DIPTERA	CULICIDAE	AEDES	52	8	CF	SWIMMER
DIPTERA	CULICIDAE	CULISETA	7	UN	CG	SWIMMER
DIPTERA	CULICIDAE	CULEX	3	10	CF	SWIMMER
DIPTERA	TIPULIDAE	LIMONIA	1	10	SH	BURROWER
ISOPODA	ASELLIDAE	CAECIDOTEA	5	7.7	CG	SWIMMER
OLIGOCHAETA	NAIDIDAE	LTLP	72	5.7	UN	UN

TABLE 15. MAY 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 2.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
DECAPODA	CAMBARIDAE		1	8	CF	BURROWER
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	41	8	CG	UN
HEMIPTERA	CORIXIDAE	PALMACORIXA	10	9	PR	SWIMMER
OLIGOCHAETA	NAIDIDAE	LTLP	5	10	CG	UN
DIPTERA	CHIRONOMIDAE	CHIRONOMINAE	44	6.5	UN	UN
ISOPODA	ASELLIDAE	CAECIDOTEA	8	7.7	CG	UN
DIPTERA	CHIRONOMIDAE	TANYPODINAE	3	5	UN	SPRAWLER
COLEOPTERA	HYDROPHILIDAE	HYDROPHILUS	2	UN	CG	SWIMMER
COLEOPTERA	HYDROPHILIDAE	TROPISTERNUS	3	9.8	UN	UN
VENEROIDEA	SPHAERIDAE		1	7	CG	UN
DIPTERA	CHAOBORIDAE	CHAOBORUS	4	8.5	PR	SPRAWLER
COLEOPTERA	DYTISCIDAE	COPTOTOMUS	3	9	PR	SWIMMER
COPEPODA	LTLP		1	UN	UN	UN

TABLE 16. WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR SITE 3

PARAMETER	UNITS	PRIMARY STANDARD	CRITICAL STANDARD	SUMMER 2011 INDIAN CREEK 9/11 - 9/15, 2011	FALL 2011 INDIAN CREEK 12/11 - 12/15, 2011	SPRING 2012 INDIAN CREEK 5/6 - 5/10, 2012	SUMMER 2012 INDIAN CREEK 8/19 - 8/23, 2012
				<i>7</i> /11 - <i>7</i> /13, 2 011	12/11 - 12/13, 2011	3/0 - 3/10, 2012	0/17 - 0/23, 2012
Color	Units	-	-	No Water	150	120	No Water
Total Solids	(mg/L)	-	-	No Water	250	200	No Water
Total Dissolved Solids	(mg/L)	-	-	No Water	190	140	No Water
Total Suspended Solids	(mg/L)	-	-	No Water	35	33	No Water
Ortho-Phosphate as P	(mg/L)	-	-	No Water	< 0.02	0.058	No Water
Total Phosphorus	(mg/L)	-	=	No Water	0.035	0.16	No Water
BOD_5	(mg/L)	-	-	No Water	< 2	4.0	No Water
Copper	(mg/L)	Hardness Based	Hardness Based	No Water	< 0.006	0.039	No Water
Zinc	(mg/L)	Hardness Based	Hardness Based	No Water	0.018	0.0120	No Water
Chloride	(mg/L)	33.7	-	No Water	23	21	No Water
Hardness as CaCO3	(mg/L)	-	-	No Water	54	57	No Water
Nitrate as N	(mg/L)	-	-	No Water	< 0.05	< 0.05	No Water
Sulfate	(mg/L)	56.3	-	No Water	39	12	No Water
Dieldrin	(µg/L)	0.0019	2.5	No Water	< 0.002	< 0.020	No Water
Fecal Coliform	CFU/100mL	-	2,000	No Water	110	4.0	No Water
Dissolved Oxygen - Grab	(mg/L)	> 5.0	> 2.0	No Water	1.5 - 3.35	0.73 - 1.89	No Water
Dissolved Oxygen - Diurnal	(mg/L)	> 5.0	> 2.0	No Water	1.35 - 4.98	0.21 - 2.51	No Water
Dissolved Oxgen - % below acute standard	%	-	=	No Water	75%	99%	No Water
Temperature - Grab	(°C)	-	< 30	No Water	5.71 - 8.35	20.62 - 23.95	No Water
Temperature - Diurnal	(°C)	-	< 30	No Water	4.93 - 8.86	20.39 - 25.01	No Water
Conductivity - Grab	(mS/cm)	-	-	No Water	0.185 - 0.210	0.177 - 0.190	No Water
Conductivity - Diurnal	(mS/cm)	-	-	No Water	0.181 - 0.227	0.174 - 0.186	No Water
pH - Grab	(s.u.)	-	6.0 - 9.0	No Water	6.65 - 6.94	6.38 - 6.75	No Water
pH - Diurnal	(s.u.)	-	6.0 - 9.0	No Water	6.03 - 6.29	6.53 - 6.66	No Water
Turbidity - Grab	(ntu)	-	< 21	No Water	13.5	13.5	No Water

10

TABLE 17. DECEMBER 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 3.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
ACARI	LTLP		2	UN	UN	UN
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	38	8	CG	UN
COLEOPTERA	SCIRTIDAE	SCIRTES	1	7	SH	CLIMBER
DIPTERA	CERATOPOGONIDAE	ATRICHOPOGON	2	6.8	PR	SPRAWLER
DIPTERA	CHIRONOMIDAE	CHIRONOMINI	1	6.5	UN	UN
DIPTERA	CULICIDAE	CULEX	28	10	CF	SWIMMER
DIPTERA	CULICIDAE	CULISETA	11	UN	CG	SWIMMER
DIPTERA	CULICIDAE	AEDES	15	8	CF	SWIMMER
GASTROPODA	PLANORBIDAE	LTLP	1	8.4	SC	UN
ISOPODA	ASELLIDAE	CAECIDOTEA	75	7.7	CG	UN
OLIGOCHAETA	NAIDIDAE	LTLP	2	10	CG	UN

TABLE 18. MAY 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 3.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	31	8	CG	UN
ISOPODA	ASELLIDAE	CAECIDOTEA	70	7.7	CG	UN
ODONATA	COENAGRIONIDAE	ENALLAGMA	1	9	PR	CLIMBER
CLADOCERA	LTLP		2	8	CF	UN
HEMIPTERA	CORIXIDAE	PALMACORIXA	5	9	PR	SWIMMER
DECAPODA	CAMBARIDAE		3	8	CF	BURROWER
COLEOPTERA	DYTISCIDAE	LIODESSUS	1	10	PR	SWIMMER
COLEOPTERA	NOTERIDAE	SUPHISELLUS	1	UN	UN	CLIMBER
COLEOPTERA	DYTISCIDAE	COPTOTOMUS	1	9	PR	SWIMMER
COLEOPTERA	DYTISCIDAE	NEOPORUS	4	UN	PR	SWIMMER
COLEOPTERA	HYDROPHILIDAE	HYDROPHILUS	4	UN	CG	SWIMMER
COLEOPTERA	DYTISCIDAE	DYTISCUS	2	5	PR	SWIMMER
COLEOPTERA	HYDROPHILIDAE	TROPISTERNUS	1	9.8	UN	UN
GASTROPODA	PHYSIDAE	LTLP	1	9.1	SC	UN
COPEPODA	LTLP		36	UN	UN	UN
DIPTERA	CHIRONOMIDAE	CHIRONOMINAE	33	6.5	UN	UN
DECAPODA	PALAEMONIIDAE		2	8	UN	UN

TABLE 19. WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR SITE 4

PARAMETER	UNITS	PRIMARY STANDARD	CRITICAL STANDARD	SUMMER 2011 COFFEE CREEK, BACKGROUND 3 9/11 - 9/15, 2011	FALL 2011 COFFEE CREEK, BACKGROUND 3 12/11 - 12/15, 2011	SPRING 2012 COFFEE CREEK, BACKGROUND 3 5/6 - 5/10, 2012	SUMMER 2012 COFFEE CREEK, BACKGROUND 3 8/19 - 8/23, 2012
Color	Units	_	-	No Water	100	400	No Water
Total Solids	(mg/L)	_	-	No Water	480	530	No Water
Total Dissolved Solids	(mg/L)	_	_	No Water	420	420	No Water
Total Suspended Solids	(mg/L)	_	_	No Water	33	60	No Water
Ortho-Phosphate as P	(mg/L)	_	_	No Water	< 0.02	0.18	No Water
Total Phosphorus	(mg/L)	-	-	No Water	0.030	1.0	No Water
BOD ₅	(mg/L)	_	-	No Water	< 2	7.3	No Water
Copper	(mg/L)	Exempt	Exempt	No Water	< 0.006	< 0.006	No Water
Zinc	(mg/L)	Exempt	Exempt	No Water	0.022	0.0045	No Water
Chloride	(mg/L)	33.7	-	No Water	47	47	No Water
Hardness as CaCO3	(mg/L)	-	-	No Water	180	200	No Water
Nitrate as N	(mg/L)	-	-	No Water	0.31	< 0.5	No Water
Sulfate	(mg/L)	56.3	-	No Water	150	4.4	No Water
Dieldrin	(µg/L)	Exempt	Exempt	No Water	< 0.002	< 0.020	No Water
Fecal Coliform	CFU/100mL	-	Exempt	No Water	38	10	No Water
Dissolved Oxygen - Grab	(mg/L)	> 5.0	> 3	No Water	2.81 - 4.33	0.71 - 1.09	No Water
Dissolved Oxygen - Diurr	(mg/L)	> 5.0	> 3	No Water	2.50 - 4.67	0.00 - 8.22	No Water
Dissolved Oxgen - % belo	%	-	-	No Water	13%	70%	No Water
Temperature - Grab	(°C)	-	< 30	No Water	5.65 - 9.40	21.01 - 23.28	No Water
Temperature - Diurnal	(°C)	-	< 30	No Water	5.74 - 9.55	21.13 - 27.76	No Water
Conductivity - Grab	(mS/cm)	=	-	No Water	0.530 - 0.618	0.640 - 0.645	No Water
Conductivity - Diurnal	(mS/cm)	-	-	No Water	0.536 - 0.619	0.620 - 0.649	No Water
pH - Grab	(s.u.)	-	6.0 - 9.0	No Water	6.72 - 7.24	6.24 - 6.33	No Water
pH - Diurnal	(s.u.)	-	6.0 - 9.0	No Water	6.92 - 7.07	7.33 - 7.91	No Water
Turbidity - Grab	(ntu)	-	< 21	No Water	2.95	16.5	No Water

TABLE 20. DECEMBER 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 4.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	56	8	CG	UN
COLEOPTERA	HYDROPHILIDAE	TROPISTERNUS	2	9.8	UN	UN
DIPTERA	CULICIDAE	AEDES	56	8	CF	SWIMMER
DIPTERA	CHAOBORIDAE	CHAOBORUS	1	8.5	PR	SPRAWLER
DIPTERA	TIPULIDAE	ERIOPTERA	1	6.5	CG	BURROWER
ISOPODA	ASELLIDAE	CAECIDOTEA	81	7.7	CG	UN
OLIGOCHAETA	NAIDIDAE	LTLP	1	10	CG	UN

Habitat: UN=Unknown

TABLE 21. MAY 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 4.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
DIPTERA	CHIRONOMIDAE	CHIRONOMINAE	161	6.5	UN	UN
DIPTERA	CHAOBORIDAE	CHAOBORUS	40	8.5	PR	SPRAWLER
DIPTERA	CHIRONOMIDAE	TANYPODINAE	1	5	UN	SPRAWER
ISOPODA	ASELLIDAE	LTLP	37	7.7	CG	UN
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	29	8	CG	UN
OLIGOCHAETA	NAIDIDAE	LTLP	3	10	CG	UN
HEMIPTERA	CORIXIDAE	PALMACORIXA	6	9	PR	SWIMMER
HIRUNDINEA			3	8.9	PAR	CLINGER
COLEOPTERA	NOTERIDAE	SUPHISELLUS	1	UN	UN	CLIMBER
COLEOPTERA	HYDROPHILIDAE	TROPISTERNUS	1	9.8	UN	UN

TABLE 22. WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR SITE 5

PARAMETER	UNITS	PRIMARY STANDARD	CRITICAL STANDARD	SUMMER 2012 COFFEE CREEK NEAR TRESTLE 9/11 - 9/15, 2011	FALL 2011 COFFEE CREEK NEAR TRESTLE 12/11 - 12/15, 2011	SPRING 2012 COFFEE CREEK NEAR TRESTLE 5/6 - 5/10, 2012	SUMMER 2012 COFFEE CREEK NEAR TRESTLE 8/19 - 8/23, 2012
Color	Units	-	ı	1,500	1,000	1,000	600
Total Solids	(mg/L)	=	-	1,800	1,600	1,600	1,700
Total Dissolved Solids	(mg/L)	-	-	1,600	1,300	1,500	1,700
Total Suspended Solids	(mg/L)	-	-	29	180	51	21
Ortho-Phosphate as P	(mg/L)	-	-	1.1	0.56	0.15	1.1
Total Phosphorus	(mg/L)	-	-	1.6	0.880	1.4	2.4
BOD_5	(mg/L)	-	-	18	< 2	46.0	14
Copper	(mg/L)	Exempt	Exempt	0.013 & 0.012	0.0084	0.050	0.0089 & 0.0096
Zinc	(mg/L)	Exempt	Exempt	0.27	0.31	0.4700	0.31 & 0.32
Chloride	(mg/L)	33.7	-	190	170	180	210
Hardness as CaCO3	(mg/L)	-	-	-	250	290	260
Nitrate as N	(mg/L)	=	-	< 0.05	< 0.05	0.18	< 0.05
Sulfate	(mg/L)	56.3	-	350	380	340	380
Dieldrin	(µg/L)	Exempt	Exempt	< 0.002	< 0.0020	< 0.020	< 0.020
Fecal Coliform	CFU/100mL	=	Exempt	< 1	150	36	3000
Dissolved Oxygen - Grab	(mg/L)	> 5.0	> 3	0.21 - 0.32	1.57 - 3.5	0.30 - 0.91	0.78 - 1.47
Dissolved Oxygen - Diurnal	(mg/L)	> 5.0	> 3	0.01 - 0.59	2.13 - 3.88	0.00 - 0.08	0.29 - 1.16
Dissolved Oxgen - % below acute standard	%	-	-	100%	81%	100%	100%
Temperature - Grab	(°C)	=	< 30	26.65 - 26.70	9.18 - 12.35	27.59 - 33.28	24.06 - 30.46
Temperature - Diurnal	(°C)	=	< 30	24.48 - 32.84	9.62 - 13.32	25.14 - 34.90	23.96 - 33.31
Conductivity - Grab	(mS/cm)	=	-	2.21	1.87 - 1.94	2.06 - 2.17	2.29 - 2.30
Conductivity - Diurnal	(mS/cm)	-	-	2.18 - 2.23	1.847 - 1.938	1.706 - 2.231	2.365 - 2.468
pH - Grab	(s.u.)	-	6.0 - 9.0	7.79	7.53 - 7.71	7.14 - 7.39	7.32 - 7.77
pH - Diurnal	(s.u.)	-	6.0 - 9.0	8.24 - 8.33	7.6 - 7.76	7.55 - 8.00	7.87-7.99
Turbidity - Grab	(ntu)	-	< 21	68.7	46.6	583	27.2

TABLE 23. AUGUST 2012 FISH SAMPLE SUMMARY FOR SITE 5

COMMON NAME	SCIENTIFIC NAME	SPECIMEN COUNT	WEIGHT MIN. AVG. MAX. (g) (g) (g)			MIN. AVG. MAX. (mm) (mm) (mm)		
shortnose gar	Lepisosteus platostomus	1		758			558	

Data has been verified in the laboratory of the Brentwood office by Misty Huddleston, Aquatic Biologist

Voucher samples sent to American Aquatics for verification of identifications.

^{*}Cells with empty values did not have a sample size sufficient enough to determine means, minimums, or maximums.

TABLE 24. DECEMBER 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 5.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
BASOMMATOPHORA	PHYSIDAE	LTLP	4	9.1	SC	UN
COLEOPTERA	DYTISCIDAE	BEROSUS	3	UN	PR	SWIMMER
COLEOPTERA	DYTISCIDAE	NEOPORUS	1	UN	PR	SWIMMER
COLEOPTERA	HYDROPHILIDAE	HELOCHARES	1	8.2	PR	UN
COLEOPTERA	SCIRTIDAE	SCIRTES	5	7	SH	CLIMBER
COLEOPTERA	CHRYSOMELIDAE	LTLP	1	UN	UN	UN
COLEOPTERA	NOTERIDAE	SUPHISELLUS	2	UN	UN	CLIMBER
COLLEMBOLA	HYPOGASTRURIDAE	LTLP	4	UN	CG	SPRAWLER
DIPTERA	SYRPHIDAE	ERISTALIS	4	10	CG	BURROWER
DIPTERA	CULICIDAE	CULISETA	4	UN	CG	SWIMMER
DIPTERA	CULICIDAE	CULEX	8	10	CF	UN
DIPTERA	CULICIDAE	AEDES	4	8	CF	SWIMMER
DIPTERA	TABANIDAE	TABANUS	1	9.7	PR	UN
DIPTERA	TIPULIDAE	LIMONIA	5	10	SH	BURROWER
DIPTERA	EPHYDRIDAE	DISCOCERINA	1	6	CG	BURROWER
DIPTERA	CHIRONOMIDAE	CHIRONOMINI	124	6.5	UN	UN
DIPTERA	CERATOPOGONIDAE	ATRICHOPOGON	1	6.8	PR	UN
DIPTERA	STRATIOMYIIDAE	ODONTOMYIA	4	UN	CG	SPRAWLER
GASTROPODA	LYMNAEIDAE	LTLP	1	6	SC	CLINGER
HEMIPTERA	NOTONECTIDAE	NOTONECTA	1	5	PR	SWIMMER
ODONATA	COENAGRIONIDAE	ISCHNURA	1	9	PR	CLIMBER
OLIGOCHAETA	NAIDIDAE	LTLP	3	10	CG	UN

TABLE 25. MAY 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 5.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
COLEOPTERA	DYTISCIDAE	COPTOTOMUS	1	9	PR	SWIMMER
COLEOPTERA	DYTISCIDAE	DEROVATELLUS	2	UN	PR	SWIMMER
COLEOPTERA	DYTISCIDAE	NEOPORUS	3	UN	PR	SWIMMER
COLEOPTERA	HALIPLIDAE	PELTODYTES	1	8.5	SH	UN
COLEOPTERA	DYTISCIDAE	LIODESSUS	2	10	PR	SWIMMER
COLEOPTERA	HYDROPHILIDAE	HYDROPHILUS	1	UN	CG	SWIMMER
DIPTERA	CHIRONOMIDAE	TANYPODINAE	3	6.5	UN	UN
COLEOPTERA	HYDROPHILIDAE	TROPISTERNUS	2	UN	CG	SWIMMER
DIPTERA	CHIRONOMIDAE	CHIRONOMINAE	36	6.5	UN	UN

TABLE 26. WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR SITE 6

PARAMETER	UNITS	PRIMARY STANDARD	CRITICAL STANDARD	SUMMER 2011 MOSSY LAKE 9/11 - 9/15, 2011	FALL 2011 MOSSY LAKE 12/11 - 12/15, 2011	SPRING 2012 MOSSY LAKE 5/6 - 5/10, 2012	SUMMER 2012 MOSSY LAKE 8/19 - 8/23, 2012
Color	Units	-	-	1,500	200	500	1,000
Total Solids	(mg/L)	-	-	1,700	430	880	1,800
Total Dissolved Solids	(mg/L)	184	-	1,500	400	830	1,800
Total Suspended Solids	(mg/L)	-	-	12	10	8.8	22
Ortho-Phosphate as P	(mg/L)	-	-	1.1	0.2	0.33	1.1
Total Phosphorus	(mg/L)	-	-	1.4	0.24	0.7	1.3
BOD_5	(mg/L)	-	-	110	2.6	5.2	16
Copper	(mg/L)	Exempt	Exempt	0.0096	< 0.006	0.037	< 0.006
Zinc	(mg/L)	Exempt	Exempt	0.26	0.068	0.0740	0.18
Chloride	(mg/L)	33.7	-	200	46	100	230
Hardness as CaCO3	(mg/L)	-	-	-	70	160	290
Nitrate as N	(mg/L)	-	-	< 0.5	0.25	< 0.05	< 0.05
Sulfate	(mg/L)	56.3	-	360	100	180	460
Dieldrin	(µg/L)	Exempt	Exempt	< 0.002	< 0.002	< 0.020	< 0.020
Fecal Coliform	CFU/100mL	-	Exempt	< 1	92	24	1,600
Dissolved Oxygen - Grab	(mg/L)	> 5	-	0.15 - 1.35	0.13 - 7.87	0.33 - 1.54	0.10 - 0.47
Dissolved Oxygen - Diurnal	(mg/L)	> 5	-	0.03 - 0.44	1.99 - 8.51	0.00 - 1.80	0.07 - 1.63
Dissolved Oxgen - % below acute standard	%	-	-	100%	17%	100%	100%
Temperature - Grab	(°C)	-	< 32	22.60 - 24.99	6.43 - 9.07	20.75 - 29.74	25.10 - 29.11
Temperature - Diurnal	(°C)	-	< 32	23.54 - 28.06	6.30 - 8.93	26.26 - 28.98	25.24-30.88
Conductivity - Grab	(mS/cm)	-	-	2.25 - 2.30	0.608 - 1.74	1.206 - 1.392	1.33 - 2.47
Conductivity - Diurnal	(mS/cm)	-	-	2.28 - 2.33	0.285 - 1.219	1.216 - 1.478	2.509 - 2.560
pH - Grab	(s.u.)	-	6.0 - 9.0	8.01 - 8.13	7.33 - 7.62	6.55 - 7.08	7.97 - 10.41
pH - Diurnal	(s.u.)	-	6.0 - 9.0	7.88 - 7.96	6.42 - 6.94	7.48 - 7.57	8.07-8.41
Turbidity - Grab	(ntu)	< 32	< 25	31.4	16.9	16.1	45.0

TABLE 27. AUGUST 2012 FISH SAMPLE SURVEY FOR SITE 6

COMMON	SCIENTIFIC	SPECIMEN	V	VEIGH	ΙΤ	TOTAL LENGTH		
NAME	NAME	COUNT	MIN. (g)	AVG. (g)	MAX. (g)	MIN. (mm)		MAX. (mm)
spotted gar	Lepisosteus oculatus	2	728	784	840	53	56.9	60.7
shortnose gar	Lepisosteus platostomus	1		504			58	
yellow bullhead	Ameiurus natalis	1		94			21	

Data has been verified in the laboratory of the Brentwood office by Misty Huddleston, Aquatic Biologist

Voucher samples sent to American Aquatics for verification of identifications.

^{*}Cells with empty values did not have a sample size sufficient enough to determine means, minimums, or maximums.

TABLE 28. DECEMBER 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 6.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
ACARI	LTLP		7	UN	UN	LINI
BASOMMATOPHORA	PHYSIDAE	LTLP	1	9.1	SC	UN UN
COLEOPTERA	HYDROPHILIDAE	HELOCHARES	6	UN	UN	SWIMMER
COLEOPTERA	NOTERIDAE	SUPHISELLUS	8	UN	UN	CLIMBER
COLEOPTERA	DYTISCIDAE	NEOPORUS	1	10	PR	SWIMMER
COLEOPTERA	HYDROPHILIDAE	BEROSUS	1	8.2	SH	SWIMMER
COLEOPTERA	HYDRAENIDAE	HYDRAENA	2	5	PR	UN
COLEOPTERA	SCIRTIDAE	SCIRTES	67	7	SH	CLIMBER
COLLEMBOLA	HYPOGASTRURIDAE	LTLP	4	UN	CG	SPRAWLER
DIPTERA	STRATIOMYIDAE	ODONTOMYIA	8	UN	CG	SPRAWLER
DIPTERA	CERATOPOGONIDAE	ATRICHOPOGON	4	6.8	PR	UN
DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	8	6.7	CG	SPRAWLER
DIPTERA	CHIRONOMIDAE	CHIRONOMINI	86	6.5	UN	UN
DIPTERA	LTLP		2	UN	UN	UN
DIPTERA	SYRPHIDAE	ERISTALIS	1	10	CG	BURROWER
HEMIPTERA	CORIXIDAE	PALMACORIXA	2	9	PR	SWIMMER
MEGALOPTERA	CORYDALIDAE	CHAULIODES	1	5.8	PR	CLINGER

TABLE 29. MAY 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 6.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
DECAPODA	CAMBARIDAE	LTLP	8	8	CF	BURROWER
DECAPODA	PALAEMONIDAE	LTLP	12	8	UN	UN
ISOPODA	ASELLIDAE	LTLP	22	7.7	CG	UN
HEMIPTERA	BELOSTOMATIDAE	BELOSTOMA	8	9.8	PR	CLIMBER
COLEOPTERA	DYTISCIDAE	CYBISTER	1	UN	PR	SWIMMER
COLEOPTERA	DYTISCIDAE	NEOPORUS	2	UN	PR	SWIMMER
COLEOPTERA	HALIPLIDAE	PELTODYTES	1	8.5	SH	UN
COLEOPTERA	DYTISCIDAE	COPTOTOMUS	4	9	PR	SWIMMER
COLEOPTERA	NOTERIDAE	SUPHISELLUS	2	UN	UN	CLIMBER
COLEOPTERA	HYDROPHILIDAE	TROPISTERNUS	3	9.8	UN	UN
EPHEMEROPTERA	CAENIDAE	CAENIS	5	7.6	CG	SPRAWLER
HIRUNDINEA	LTLP		1	8.9	PAR	CLINGER
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	25	8	CG	UN
EPHEMEROPTERA	EPHEMERIDAE	HEXAGENIA	1	4.7	CG	BURROWER
HEMIPTERA	CORIXIDAE	PALMACORIXA	12	9	PR	SWIMMER
CLADOCERA	LTLP		1	8	CF	UN
DIPTERA	DOLICHOPODIDAE	LTLP	1	9.7	PR	SPRAWLER
OLIGOCHAETA	LTLP		1	10	CG	UN
DIPTERA	CHIRONOMIDAE	TANYPODINAE	5	5	UN	SPRAWLER
DIPTERA	CHIRONOMIDAE	CHIRONOMINAE	127	6.5	UN	UN
COLEOPTERA	GYRINIDAE	DINEUTUS	1	5.5	PR	SWIMMER
COLEOPTERA	HYDROPHILIDAE	HYDROPHILUS	2	UN	CG	SWIMMER
ODONATA	CORDULIIDAE	EPITHECA	1	7	PR	CLIMBER
ODONATA	COENAGRIONIDAE	ISCHURA	4	9	PR	CLIMBER

TABLE 30. WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR SITE 7

PARAMETER	UNITS	PRIMARY STANDARD	CRITICAL STANDARD	SUMMER 2011 FELSENTHAL REFERENCE STREAM 9/11 - 9/15, 2011	FALL 2011 FELSENTHAL REFERENCE STREAM 12/11 - 12/15, 2011	SPRING 2012 FELSENTHAL REFERENCE STREAM 5/6 - 5/10, 2012	SUMMER 2012 FELSENTHAL REFERENCE STREAM 8/19 - 8/23, 2012
Color	Units	-	-	No Water	150	No Water	No Water
Total Solids	(mg/L)	-	-	No Water	140	No Water	No Water
Total Dissolved Solids	(mg/L)	-	-	No Water	130	No Water	No Water
Total Suspended Solids	(mg/L)	-	-	No Water	19	No Water	No Water
Ortho-Phosphate as P	(mg/L)	-	-	No Water	< 0.02	No Water	No Water
Total Phosphorus	(mg/L)	-	-	No Water	0.024	No Water	No Water
BOD_5	(mg/L)	-	-	No Water	< 2	No Water	No Water
Copper	(mg/L)	Hardness Based	Hardness Based	No Water	< 0.006	No Water	No Water
Zinc	(mg/L)	Hardness Based	Hardness Based	No Water	0.016	No Water	No Water
Chloride	(mg/L)	33.7	-	No Water	15	No Water	No Water
Hardness as CaCO3	(mg/L)	-	-	No Water	15	No Water	No Water
Nitrate as N	(mg/L)	-	-	No Water	0.12	No Water	No Water
Sulfate	(mg/L)	56.3	-	No Water	13	No Water	No Water
Dieldrin	(µg/L)	0.0019	2.5	No Water	< 0.002	No Water	No Water
Fecal Coliform	CFU/100mL	-	2000	No Water	37	No Water	No Water
Dissolved Oxygen - Grab	(mg/L)	> 5.0	> 2.0	No Water	2.48 - 6.82	No Water	No Water
Dissolved Oxygen - Diurnal	(mg/L)	> 5.0	> 2.0	No Water	0.03 - 1.90	No Water	No Water
Dissolved Oxgen - % below acute standard	%	-	-	No Water	100%	No Water	No Water
Temperature - Grab	(°C)	-	< 30	No Water	4.8 - 10.23	No Water	No Water
Temperature - Diurnal	(°C)	-	< 30	No Water	4.20 - 10.24	No Water	No Water
Conductivity - Grab	(mS/cm)	-	-	No Water	0.093 - 0.106	No Water	No Water
Conductivity - Diurnal	(mS/cm)	-	-	No Water	0.090 - 0.127	No Water	No Water
pH - Grab	(s.u.)	-	6.0 - 9.0	No Water	5.53 - 6.22	No Water	No Water
pH - Diurnal	(s.u.)	-	6.0 - 9.0	No Water	4.95 - 5.23	No Water	No Water
Turbidity - Grab	(ntu)	-	< 21	No Water	9.95	No Water	No Water

TABLE 31. DECEMBER 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 7.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
COLEOPTERA	SCARABAEIDAE	OSMODERMA	1	UN	UN	UN
ISOPODA	ASELLIDAE	CAECIDOTEA	162	7.7	CG	UN
DECAPODA	CAMBARIDAE	LTLP	5	8	CF	BURROWER
OLIGOCHAETA	NAIDIDAE	LTLP	2	10	CG	UN
DIPTERA	CHIRONOMIDAE	CHIRONOMINI	6	6.5	UN	UN
COLEOPTERA	DYTISCIDAE	NEOPORUS	3	UN	PR	SWIMMER
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	31	8	CG	UN

TABLE 32. WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR SITE 8

PARAMETER	UNITS	PRIMARY STANDARD	CRITICAL STANDARD	SUMMER 2011 WILDCAT LAKE 9/11 - 9/15, 2011	FALL 2011 WILDCAT LAKE 12/11 - 12/15, 2011	SPRING 2012 WILDCAT LAKE 5/6 - 5/10, 2012	SUMMER 2012 WILDCAT LAKE 8/19 - 8/23, 2012
Color	Units	-	-	30	100	80	45
Total Solids	(mg/L)	-	-	100	76	110	110
Total Dissolved Solids	(mg/L)	-	-	40	56	77	60
Total Suspended Solids	(mg/L)	-	-	9.6	16	14	12
Ortho-Phosphate as P	(mg/L)	-	-	< 0.02	0.026	< 0.02	< 0.02
Total Phosphorus	(mg/L)	-	-	0.036	0.03	0.084	0.034
BOD_5	(mg/L)	-	-	2.4	< 2	< 2.0	2.5
Copper	(mg/L)	Hardness Based	Hardness Based	< 0.006	< 0.006	0.039	< 0.006
Zinc	(mg/L)	Hardness Based	Hardness Based	0.0041	0.0075	0.0061	0.0070
Chloride	(mg/L)	33.7	-	4.8	6.4	10	8.2
Hardness as CaCO3	(mg/L)	-	-	-	16.0	23.0	19.0
Nitrate as N	(mg/L)	-	-	< 0.05	0.34	< 0.05	< 0.05
Sulfate	(mg/L)	56.3	-	7	9.1	8.1	6.6
Dieldrin	(µg/L)	0.0019	2.5	< 0.002	< 0.002	< 0.020	< 0.020
Fecal Coliform	CFU/100mL	-	400	200	63	6.0	110
Dissolved Oxygen - Grab	(mg/L)	> 5	-	5.75 - 7.52	7.38 - 8.73	4.95 - 9.38	4.59 - 6.13
Dissolved Oxygen - Diurnal	(mg/L)	> 5	-	0.44 - 5.73	8.83 - 9.90	4.32 - 8.50	4.37 - 8.16
Dissolved Oxgen - % below acute standard	%	-	-	46%	0%	0%	0%
Temperature - Grab	(°C)	-	< 32	26.10 - 29.48	7.25 - 8.41	25.04 - 27.67	27.51 - 28.75
Temperature - Diurnal	(°C)	-	< 32	25.22 - 26.60	7.08 - 8.44	23.71 - 31.55	26.75-30.84
Conductivity - Grab	(mS/cm)	-	-	0.068 - 0.070	0.066 - 0.069	0.091 - 0.097	0.073 - 0.078
Conductivity - Diurnal	(mS/cm)	-	-	0.068 - 0.073	0.061 - 0.070	0.088 - 0.095	0.071 - 0.085
pH - Grab	(s.u.)	-	6.0 - 9.0	7.04 - 7.29	6.38 - 6.75	645 - 6.62	6.56 - 7.54
pH - Diurnal	(s.u.)	-	6.0 - 9.0	6.24 - 6.45	7.54 - 7.76	-	6.59-7.27
Turbidity - Grab	(ntu)	< 32	< 25	28.5	24.5	10.8	19.7

TABLE 33. SEPTEMBER 2011 FISH SAMPLE SUMMARY FOR SITE 8

COMMON	SCIENTIFIC	SPECIMEN	V	VEIGHT	ı	TOTAL LENGTH		
NAME	NAME NAME		MIN. (g)	AVG. (g)	MAX. (g)	MIN. (mm)	AVG. (mm)	MAX. (mm)
black crappie	Pomoxis nigromaculatus	1		283.5			270.0	
threadfin shad	Dorosoma petenense	1		15.0			121.0	
spotted sucker	Minytrema melanops	1		15.0			120.0	
pallid shiner	Notropis amnis	2	0.3	0.3	0.3	50.0	53.0	56.0
channel catfish	Ictalurus furcatus	2	198.5	326.0	453.6	318.0	349.0	380.0
smallmouth bass	Micropterus dolomieui	2	14.0	134.6	255.2	110.0	202.0	294.0
spotted bass	Micropterus punctulatus	3	0.5	8.8	14.0	75.0	101.3	118.0
spotted gar	Lepisosteus oculatus	3	311.8	453.6	567.0	354.0	463.3	581.0
common carp	Cyprinus carpio	3	2211.3	2560.9	3061.8	536.0	572.0	630.0
warmouth	Lepomis gulosus	4	8.0	12.3	17.0	83.0	94.8	104.0
redear sunfish	Lepomis microlophus	8	10.0	13.4	21.0	87.0	101.0	114.0
largemouth bass	Micropterus salmoides	21	3.0	77.5	680.4	90.0	148.8	362.0
bluegill	Lepomis macrochirus	30	0.3	13.1	72.0	36.0	90.0	144.0
gizzard shad	Dorosoma cepedianum	30	56.7	260.8	1360.8	172.0	266.8	340.0

Data has been verified in the laboratory of the Brentwood office by Misty Huddleston, Aquatic Biologist

Voucher samples sent to American Aquatics for verification of identifications.

^{*}Cells with empty values did not have a sample size sufficient enough to determine means, minimums, or maximums.

TABLE 34. AUGUST 2012 FISH SAMPLE SUMMARY FOR SITE 8

COMMON	SCIENTIFIC	SPECIMEN		WEIGHT		TO	TOTAL LENGTH		
NAME	NAME	COUNT	MIN. (g)	AVG. (g)	MAX. (g)	MIN. (mm)	AVG. (mm)	MAX. (mm)	
spotted sunfish	Lepomis punctatus	1		80.0			125.0		
orangespotted sunfish	Lepomis humilis	1		18.0			94.0		
brook silverside	Labidesthes sicculus	1		NA			48.0		
warmouth	Lepomis gulosus	1		56.7			160.0		
channel catfish	Ictalurus furcatus	1		453.6			206.0		
black buffalo	Ictiobus niger	1		1871.1			470.0		
smallmouth bass	Micropterus dolomieu	1		113.4			234.0		
shortnose gar	Lepisosteus platostomus	3	737.1	897.7	1134.0	599.0	637.7	670.0	
spotted gar	Lepisosteus oculatus	3	453.6	538.7	595.4	550.0	567.3	588.0	
spotted sucker	Minytrema melanops	3	7.0	9.3	11.0	86.0	94.3	100.0	
freshwater drum	Aplodinotus grunniens	4	368.5	779.6	1134.0	326.0	392.0	452.0	
smallmouth buffalo	Ictiobus bubalus	5	567.0	1848.4	2381.4	341.0	466.8	518.0	
largemouth bass	Micropterus salmoides	9	3.0	178.4	793.8	94.0	199.2	382.0	
redear sunfish	Lepomis microlophus	15	1.0	20.1	141.7	38.0	86.5	207.0	
threadfin shad	Dorosoma petenense	15	3.0	3.0	3.0	48.0	56.3	80.0	
gizzard shad	Dorosoma cepedianum	42	11.0	194.8	453.6	120.0	259.1	361.1	
bluegill	Lepomis macrochirus	53	1.0	8.4	50.0	31.0	63.3	143.0	

NA indicates specimens that were too small to register a weight.

Data has been verified in the laboratory of the Brentwood office by Misty Huddleston, Aquatic Biologist

Voucher samples sent to American Aquatics for verification of identifications.

^{*}Cells with empty values did not have a sample size sufficient enough to determine means, minimums, or maximums.

TABLE 35. DECEMBER 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 8.

ORDER	FAMILY GENUS		SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	10	8	CG	UN
COPEPODA	CLADOCERA	LTLP	105	8	CF	UN
COLEOPTERA	DYTISCIDAE	NEOPORUS	1	UN	PR	SWIMMER
COLEOPTERA	DYTISCIDAE	NEOPORUS	1	10	PR	SWIMMER
COLEOPTERA	HALIPLIDAE	PELTODYTES	1	8.5	SH	UN
DIPTERA	CHIRONOMIDAE	CHIRONOMINI	76	6.5	UN	UN
EPHEMEROPTERA	CAENIDAE	CAENIS	6	7.6	CG	SPRAWLER
HEMIPTERA	CORIXIDAE	PALMACORIXA	3	9	PR	SWIMMER
HEMIPTERA	NOTONECTIDAE	NOTONECTA	1	5	PR	UN
HEMIPTERA	MESOVELIIDAE	MESOVELIA	1	6	PR	SKATER
ISOPODA	ASELLIDAE	CAECIDOTEA	1	7.7	CG	UN
MEGALOPTERA	CORYDALIDAE	CHAULIODES	1	5.8	PR	CLINGER
ODONATA	COENAGRIONIDAE	ISCHNURA	5	9	PR	CLIMBER
OLIGOCHAETA	NAIDIDAE	LTLP	13	10	CG	UN
TRICHOPTERA	LEPTOCERIDAE	OECETIS	2	5.7	UN	UN
TRICHOPTERA	POLYCENTROPODIDAE	CYRNELLUS	8	4.4	CF	CLINGER

TABLE 36. MAY 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 8.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
AMPHIPODA	TALITRIDAE	LTLP	52	8	CG	UN
				9		
COLEOPTERA	DYTISCIDAE	COPTOTOMUS	5		PR	SWIMMER
COLEOPTERA	DYTISCIDAE	LIODESSUS	6	10	PR	SWIMMER
COLEOPTERA	DYTISCIDAE	NEOPORUS	63	UN	PR	SWIMMER
COLEOPTERA	DYTISCIDAE	PACHYDRUS	3	UN	PR	SWIMMER
COLEOPTERA	HALIPLIDAE	PELTODYTES	6	8.5	SH	UN
COLEOPTERA	NOTERIDAE	SUPHISELLUS	11	UN	UN	CLIMBER
DECAPODA	CAMBARIDAE		5	8	CF	BURROWER
DECAPODA	PALAEMONIDAE		12	8	UN	UN
DIPTERA	CERATOPOGONIDAE	SERROMYIA	1	8	UN	UN
DIPTERA	CHAOBORIDAE	CHABORUS	3	8.5	PR	SPRAWLER
DIPTERA	CHIRONOMIDAE	CHIRONOMINAE	30	6.5	UN	UN
DIPTERA	CHIRONOMIDAE	TANYPODINAE	6	5	UN	SPRAWLER
EPHEMEROPTERA	CAENIDAE	CAENIS	5	7.6	CG	SPRAWLER
MESOGASTROPODA	HYDROBIIDAE	LTLP	6	6.5	SC	UN
ISOPODA	ASELLIDAE	LTLP	2	7.7	CG	UN
ODONATA	COENAGRIONIDAE	ISCHURA	5	9	PR	CLIMBER
ODONATA	CORDULIIDAE	EPITHECA	7	7	PR	CLIMBER
ODONATA	CORDULIIDAE	SOMATOCHLORA	1	8.9	PR	SPRAWLER
HIRUDINAE	LTLP		53	8.9	PAR	CLINGER
OLIGOCHAETA	NAIDIDAE	LTLP	13	10	CG	UN
UNIONOIDEA	UNIONIDAE	LTLP	1	3.65	CF	UN
VENEROIDA	SPHAERIIDAE	LTLP	1	7	CG	UN

TABLE 37. WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR SITE 9

PARAMETER	UNITS	PRIMARY STANDARD	CRITICAL STANDARD	SUMMER 2011 COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 9/11 - 9/15, 2011	FALL 2011 COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 12/11 - 12/15, 2011	SPRING 2012 COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 5/6 - 5/10, 2012	SUMMER 2012 COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 8/19 - 8/23, 2012
Color	Units			1,500	Site Flooded	500	500
Total Solids	0	-	-	1,700	Site Flooded Site Flooded	890	1,900
	(mg/L)	-	-	,			
Total Dissolved Solids	(mg/L)	184	-	1,500	Site Flooded	870	1,800
Total Suspended Solids	(mg/L)	-	-	17	Site Flooded	10	23
Ortho-Phosphate as P	(mg/L)	-	-	1.2	Site Flooded	0.25	1.1
Total Phosphorus	(mg/L)	-	-	1.4	Site Flooded	0.690	1.3
BOD ₅	(mg/L)	-	-	89	Site Flooded	7.2	12
Copper	(mg/L)	Exempt	Exempt	0.0076	Site Flooded	0.041	< 0.006
Zinc	(mg/L)	Exempt	Exempt	0.24	Site Flooded	0.8800	0.14
Chloride	(mg/L)	33.7	-	210	Site Flooded	100	230
Hardness as CaCO3	(mg/L)	-	-	-	Site Flooded	160	280
Nitrate as N	(mg/L)	-	-	< 0.5	Site Flooded	< 0.05	< 0.05
Sulfate	(mg/L)	56.3	-	360	Site Flooded	180.0	460
Dieldrin	(µg/L)	Exempt	Exempt	< 0.002	Site Flooded	< 0.020	< 0.020
Fecal Coliform	CFU/100mL	-	Exempt	< 1	Site Flooded	12	400
Dissolved Oxygen - Grab	(mg/L)	> 5.0	> 3	4.21 - 4.37	Site Flooded	3.97 - 4.64	2.88 - 3.70
Dissolved Oxygen - Diurnal	(mg/L)	> 5.0	> 3	3.94 - 5.03	Site Flooded	3.34 - 4.91	2.45 - 4.21
Dissolved Oxgen - % below acute standard	%	-	-	0%	Site Flooded	0%	29%
Temperature - Grab	(°C)	-	< 30	24.84 - 26.68	Site Flooded	24.2 - 29.75	25.01 - 26.50
Temperature - Diurnal	(°C)	-	< 30	23.15 - 27.20	Site Flooded	26.65 - 32.86	25.04-30.50
Conductivity - Grab	(mS/cm)	-	-	2.290	Site Flooded	1.232 - 1.419	2.45 - 2.48
Conductivity - Diurnal	(mS/cm)	-	-	2.280 - 2.310	Site Flooded	1.220 - 1.399	2.457 - 2.528
pH - Grab	(s.u.)	-	6.0 - 9.0	8.04 - 8.08	Site Flooded	6.80 - 7.50	8.03 - 8.05
pH - Diurnal	(s.u.)	-	6.0 - 9.0	7.97 - 8.02	Site Flooded	7.64 - 7.77	8.11-8.31
Turbidity - Grab	(ntu)	-	< 21	36.50	Site Flooded	15.0	68.7

TABLE 38. SEPTEMBER 2011 FISH SAMPLE SUMMARY FOR SITE 9

COMMON NAME	SCIENTIFIC NAME	COUNT	WIN.	VEIGHT AVG.	MAX.		AL LEN AVG.	
			(g)	(g)	(g)	(mm)	(mm)	(mm)
longnose gar	Lepisosteus osseus	1		283.5			479.0	
freshwater drum	Aplodinotus grunniens	1		113.4			210.0	
blue catfish	Ictalurus furcatus	2	567.0	836.3	1,106	428.0	472.5	517.0

Data has been verified in the laboratory of the Brentwood office by Misty Huddleston, Aquatic Biologist Voucher samples sent to American Aquatics for verification of identifications.

^{*}Cells with empty values did not have a sample size sufficient enough to determine means, minimums, or maximums.

TABLE 39. AUGUST 2012 FISH SAMPLE SUMMARY FOR SITE 9

COMMON	SCIENTIFIC	SPECIMEN	v	VEIGHT		TOTAL LENGTH		
NAME	NAME	COUNT	MIN. (g)	AVG. (g)	MAX. (g)	MIN. (mm)	AVG. (mm)	MAX. (mm)
yellow bullhead	Ameiurus natalis	1		30.0			145.0	
channel catfish	Ictalurus furcatus	1		1048.9			465.0	
shortnose gar	Lepisosteus platostomus	1		935.5			642.0	
gizzard shad	Dorosoma cepedianum	2	113.4	141.8	170.1	232.0	253.0	274.0
mosquitofish	Gambusia affinis	3	0.3	0.3	0.3	19.0	21.7	25.0

Data has been verified in the laboratory of the Brentwood office by Misty Huddleston, Aquatic Biologist

Voucher samples sent to American Aquatics for verification of identifications.

^{*}Cells with empty values did not have a sample size sufficient enough to determine means, minimums, or maximums.

12

TABLE 40. MAY 2012 BENTHIC MACROINVERTEBRATE SAMPLE SUMMARY FOR SITE 9.

ORDER	FAMILY	GENUS	SPECIMEN COUNT	TOLERANCE VALUE	FUNCTIONAL FEEDING GROUP	HABITAT TYPE
DIDTED A	CHAODODIDAE	CHAODODIS	1	8.5	PR	CDD AWI ED
DIPTERA	CHAOBORIDAE	CHAOBORUS	1			SPRAWLER
ISOPODA	ASELLIDAE	CAECIDOTEA	10	7.7	CG	
DECAPODA	CAMBARIDAE		14	8	CF	BURROWER
COLEOPTERA	HYDROPHILIDAE	HYDROCHARA	3	UN	UN	SWIMMER
TRICHOPTERA	HYDROPSYCHIDAE	HYDROPSYCHE	4	8	CF	CLINGER
HEMIPTERA	CORIXIDAE	PALMACORIXA	2	9	PR	SWIMMER
HIRUNDINEA	LTLP		1	8.9	PAR	CLINGER
ODONATA	COENAGRIONIDAE	ISCHURA	5	9	PR	CLIMBER
COLEOPTERA	GYRINIDAE	DINEUTUS	1	5.5	PR	SWIMMER
COLEOPTERA	HYDROPHILIDAE	TROPISTERNUS	1	9.8	UN	UN
COLEOPTERA	DYTISCIDAE	NEOPORUS	4	UN	PR	SWIMMER
EPHEMEROPTERA	CAENIDAE	CAENIS	81	7.6	CG	SPRAWLER
DIPTERA	CHIRONOMIDAE	CHIRONOMINAE	118	6.5	UN	UN
AMPHIPODA	CRANGONYCTIDAE	CRANGONYX	2	8	CG	UN
ODONATA	CORDULIIDAE	LTLP	1	8	PR	CLIMBER
DIPTERA	CHIRONOMIDAE	TANYPODINAE	11	5	UN	SPRAWLER

TABLE 41. WATER QUALITY AND CHEMICAL ANALYSES COMPARISON OF RESULTS FOR STREAM SAMPLES

PARAMETER	UNITS	SUMMER 2011 FELSENTHAL REFERENCE STREAM 9/11 - 9/15, 2011	SUMMER 2011 SITE 1. COFFEE CREEK, BACKGROUND 9/11 - 9/15, 2011	SUMMER 2011 SITE 2. COFFEE CREEK, BACKGROUND 2 9/11 - 9/15, 2011	SUMMER 2011 SITE 3. INDIAN CREEK 9/11 - 9/15, 2011	SUMMER 2011 SITE 4. COFFEE CREEK, BACKGROUND 3 9/11 - 9/15, 2011	SUMMER 2012 SITE 5. COFFEE CREEK NEAR TRESTLE 9/11 - 9/15, 2011	SUMMER 2011 SITE 9. COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 9/11 - 9/15, 2011
Color	Units	No Water	60	No Water	No Water	No Water	1,500	1,500
Total Solids	(mg/L)	No Water	160	No Water	No Water	No Water	1,800	1,700
Total Dissolved Solids	(mg/L)	No Water	120	No Water	No Water	No Water	1,600	1,500
Total Suspended Solids	(mg/L)	No Water	11	No Water	No Water	No Water	29	17
Ortho-Phosphate as P	(mg/L)	No Water	0.031	No Water	No Water	No Water	1.1	1.2
Total Phosphorus	(mg/L)	No Water	0.18	No Water	No Water	No Water	1.6	1.4
BOD_5	(mg/L)	No Water	6.6	No Water	No Water	No Water	18	89
Copper	(mg/L)	No Water	< 0.006	No Water	No Water	No Water	0.013 & 0.012	0.0076
Zinc	(mg/L)	No Water	0.0042	No Water	No Water	No Water	0.27	0.24
Chloride	(mg/L)	No Water	3.2	No Water	No Water	No Water	190	210
Hardness as CaCO3	(mg/L)	No Water	=	No Water	No Water	No Water	-	=
Nitrate as N	(mg/L)	No Water	< 0.05	No Water	No Water	No Water	< 0.05	< 0.5
Sulfate	(mg/L)	No Water	6.4	No Water	No Water	No Water	350	360
Dieldrin	(µg/L)	No Water	< 0.002	No Water	No Water	No Water	< 0.002	< 0.002
Fecal Coliform	CFU/100mL	No Water	800	No Water	No Water	No Water	< 1	< 1
Dissolved Oxygen - Grab	(mg/L)	No Water	1.39 - 3.76	No Water	No Water	No Water	0.21 - 0.32	4.21 - 4.37
Dissolved Oxygen - Diurnal	(mg/L)	No Water	0.0 - 2.83	No Water	No Water	No Water	0.01 - 0.59	3.94 - 5.03
Dissolved Oxgen - % below acute standard	%	No Water	98%	No Water	No Water	No Water	100%	0%
Temperature - Grab	(°C)	No Water	22.45 - 24.17	No Water	No Water	No Water	26.65 - 26.70	24.84 - 26.68
Temperature - Diurnal	(°C)	No Water	20.89 - 21.78	No Water	No Water	No Water	24.48 - 32.84	23.15 - 27.20
Conductivity - Grab	(mS/cm)	No Water	0.147 - 0.150	No Water	No Water	No Water	2.21	2.290
Conductivity - Diurnal	(mS/cm)	No Water	0.146 - 0.184	No Water	No Water	No Water	2.18 - 2.23	2.280 - 2.310
pH - Grab	(s.u.)	No Water	6.70 - 6.98	No Water	No Water	No Water	7.79	8.04 - 8.08
pH - Diurnal	(s.u.)	No Water	6.69 - 6.78	No Water	No Water	No Water	8.24 - 8.33	7.97 - 8.02
Turbidity - Grab	(ntu)	No Water	4.60	No Water	No Water	No Water	68.7	36.50
	ì							

TABLE 42. HABITAT QUALITY AND BIOLOGICAL ANALYSES RESULTS FOR STREAM ASSESSMENTS EVENT 1

PARAMETER	UNITS	SUMMER 2011 FELSENTHAL REFERENCE STREAM 9/11 - 9/15, 2011	SUMMER 2011 SITE 1. COFFEE CREEK, BACKGROUND 9/11 - 9/15, 2011	SUMMER 2011 STITE 2. COFFEE CREEK, BACKGROUND 2 9/11 - 9/15, 2011	SUMMER 2011 SITE 3. INDIAN CREEK 9/11 - 9/15, 2011	SUMMER 2011 SITE 4. COFFEE CREEK, BACKGROUND 3 9/11 - 9/15, 2011	SUMMER 2012 SITE 5. COFFEE CREEK NEAR TRESTLE 9/11 - 9/15, 2011	SUMMER 2011 SITE 9. COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 9/11 - 9/15, 2011
BIOLOGICAL								
ANALYSIS								
Sampling Method		None	Backpack EF	None	None	None	Seine	Seine
Water Presence		No	Yes	No	No	No	Yes	Yes
Fish Collected		No	Yes	No	No	No	No	Yes
Fish Community								
Density	#		26					4
Diversity	#		3					3
Mean Weight	g		0.35					517
Mean Length	mm		52.54					409
Dom Species (DS)	Name		Hybognathus nuchalis					Ictalurus furcatus
DS Abundance	#		13					2
DS Mean Weight	g		0.2					836
DS Mean Length	mm		66.08					472.5
Subdom Species (SS)	Name		Gambusia affinis					NA
SS Abundance	#		11					NA
SS Mean Weight	g		0.04					NA
SS Mean Length	mm		33.27					NA
HABITAT QUALITY*								
Method-RBP Low								
Meinoa-KBF Low Gradient								
Epifuanal Substrate/								
Available Cover	Scale 0-20	15	10	7	6	8	19	16
Pool Substrate		15	10	,	0	Ü	17	10
Characterization	Scale 0-20	13	8	7	6	10	15	11
Pool Variability	Scale 0-20	2	5	0	0	0	8	13
Sediment Deposition	Scale 0-20	20	10	11	16	11	6	10
Channel Flow Status	Scale 0-20	0	5	0	0	0	18	15
Channel Alteration	Scale 0-20	20	20	17	19	19	17	15
Channel Sinuosity	Scale 0-20	13	13	16	8	8	8	14
Bank Stability (Sum LB/RB)	Scale 0-40	36	6	8	30	32	20	12
Riparian Vegetative Zone (Sum LB/RB)	Scale 0-40	40	30	38	36	40	33	30
Total Score	Scale 0-220	159	107	104	121	128	144	136
Comparability to Reference	%	107	67.30	65.41	76.10	80.50	90.57	85.53

TABLE 43. WATER QUALITY AND CHEMICAL ANALYSES COMPARISON OF RESULTS FOR STREAM SAMPLES

PARAMETER	UNITS	FALL 2011 SITE 7. FELSENTHAL REFERENCE STREAM 12/11 - 12/15, 2011	FALL 2011 SITE 1 COFFEE CREEK, BACKGROUND 12/11 - 12/15, 2011	FALL 2011 SITE 2. COFFEE CREEK, BACKGROUND 2 12/11 - 12/15, 2011	FALL 2011 SITE 3. INDIAN CREEK 12/11 - 12/15, 2011	FALL 2011 SITE 4. COFFEE CREEK, BACKGROUND 3 12/11 - 12/15, 2011	FALL 2011 SITE 5. COFFEE CREEK NEAR TRESTLE 12/11 - 12/15, 2011	FALL 2011 SITE 9. COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 12/11 - 12/15, 2011
Color	Units	150	50	50	150	100	1,000	Site Flooded
Total Solids	(mg/L)	140	90	240	250	480	1,600	Site Flooded
Total Dissolved Solids	(mg/L)	130	74	240	190	420	1,300	Site Flooded
Total Suspended Solids	(mg/L)	19	8.4	5.2	35	33	180	Site Flooded
Ortho-Phosphate as P	(mg/L)	< 0.02	0.02	< 0.02	< 0.02	< 0.02	0.56	Site Flooded
Total Phosphorus	(mg/L)	0.024	0.041	0.052	0.035	0.030	0.880	Site Flooded
BOD_5	(mg/L)	< 2	< 2	< 2	< 2	< 2	< 2	Site Flooded
Copper	(mg/L)	< 0.006	< 0.006	< 0.006	< 0.006	< 0.006	0.0084	Site Flooded
Zinc	(mg/L)	0.016	0.0066	0.0086, 0.0064	0.018	0.022	0.31	Site Flooded
Chloride	(mg/L)	15	7.3	42	23	47	170	Site Flooded
Hardness as CaCO3	(mg/L)	15	27	79, 74	54	180	250	Site Flooded
Nitrate as N	(mg/L)	0.12	< 0.05	0.21	< 0.05	0.31	< 0.05	Site Flooded
Sulfate	(mg/L)	13	6.3	43	39	150	380	Site Flooded
Dieldrin	(µg/L)	< 0.002	< 0.002	< 0.0020	< 0.002	< 0.002	< 0.0020	Site Flooded
Fecal Coliform	CFU/100mL	37	64	100, 57	110	38	150	Site Flooded
Dissolved Oxygen - Grab	(mg/L)	2.48 - 6.82	6.51 - 7.55	6.22 - 6.84	1.5 - 3.35	2.81 - 4.33	1.57 - 3.5	Site Flooded
Dissolved Oxygen - Diurnal	(mg/L)	0.03 - 1.90	5.90 - 7.59	4.97 - 6.98	1.35 - 4.98	2.50 - 4.67	2.13 - 3.88	Site Flooded
Dissolved Oxgen - % below acute standard	%	100%	0%	0%	75%	13%	81%	Site Flooded
Temperature - Grab	(°C)	4.8 - 10.23	5.92 - 7.15	6.01 - 9.33	5.71 - 8.35	5.65 - 9.40	9.18 - 12.35	Site Flooded
Temperature - Diurnal	(°C)	4.20 - 10.24	5.27 - 9.85	3.86 - 9.30	4.93 - 8.86	5.74 - 9.55	9.62 - 13.32	Site Flooded
Conductivity - Grab	(mS/cm)	0.093 - 0.106	0.085 - 0.093	0.307 - 0.564	0.185 - 0.210	0.530 - 0.618	1.87 - 1.94	Site Flooded
Conductivity - Diurnal	(mS/cm)	0.090 - 0.127	0.086 - 0.094	0.307 - 0.568	0.181 - 0.227	0.536 - 0.619	1.847 - 1.938	Site Flooded
pH - Grab	(s.u.)	5.53 - 6.22	6.39 - 7.35	6.45 - 7.52	6.65 - 6.94	6.72 - 7.24	7.53 - 7.71	Site Flooded
pH - Diurnal	(s.u.)	4.95 - 5.23	7.00 - 7.09	6.73 - 7.12	6.03 - 6.29	6.92 - 7.07	7.6 - 7.76	Site Flooded
Turbidity - Grab	(ntu)	9.95	9.79	10.0	13.5	2.95	46.6	Site Flooded

PARAMETER	UNITS	FALL 2011 SITE 7. FELSENTHAL REFERENCE STREAM 12/11 - 12/15, 2011	FALL 2011 SITE 1 COFFEE CREEK, BACKGROUND 12/11 - 12/15, 2011	FALL 2011 SITE 2. COFFEE CREEK, BACKGROUND 2 12/11 - 12/15, 2011	FALL 2011 SITE 3. INDIAN CREEK 12/11 - 12/15, 2011	FALL 2011 SITE 4. COFFEE CREEK, BACKGROUND 3 12/11 - 12/15, 2011	FALL 2011 SITE 5. COFFEE CREEK NEAR TRESTLE 12/11 - 12/15, 2011	FALL 2011 SITE 9. COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 12/11 - 12/15, 2011
BIOLOGICAL ANALYSIS								
Sampling Method		D-Frame Dip Net	D-Frame Dip Net	D-Frame Dip Net	D-Frame Dip Net	D-Frame Dip Net	D-Frame Dip Net	None
Water Presence		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Benthic Macroinvertebrate Community								
Density	#	209	194	187	176	198	182	Site Flooded
Diversity	#	6	7	13	11	7	21	Site Flooded
EPT Diversity	#	0	0	0	0	0	0	Site Flooded
Dominant Functional								
Feeding Group	Class	Collector/Gatherer	Collector/Gatherer	Collector/Gatherer	Collector/Gatherer	Collector/Gatherer	Predator	Site Flooded
Mean Tolerance Value	Scale	8	8.3	8	8	8.4	8.2	Site Flooded
Dominant Species	Name	Asellidae (Isopoda)	Naididae (Oligochaeta)	Naididae (Oligochaeta)	Asellidae (Isopoda)	Asellidae (Isopoda)	Chironomidae (Diptera)	Site Flooded
HABITAT QUALITY*								
Method-RBP Low Gradient								
Epifuanal Substrate/ Available Cover	Scale 0-20	14	10	6	6	3	12	Site Flooded
Pool Substrate	Scale 0-20							
Characterization		15	6	11	9	11	11	Site Flooded
Pool Variability	Scale 0-20	10	15	6	6	6	6	Site Flooded
Sediment Deposition	Scale 0-20	20	6	9	18	15	6	Site Flooded
Channel Flow Status	Scale 0-20	20	16	7	5	16	11	Site Flooded
Channel Alteration	Scale 0-20	20	15	15	20	16	18	Site Flooded
Channel Sinuosity	Scale 0-20	20	15	14	11	8	10	Site Flooded
Bank Stability (Sum LB/RB)	Scale 0-40	40	20	8	40	32	24	Site Flooded
Riparian Vegetative Zone (Sum LB/RB)	Scale 0-40	40	31	34	35	40	35	Site Flooded
Total Score	Scale 0-220	199	134	110	150	147	133	Site Flooded
Comparability to Reference	%		67.34	55.28	75.38	73.87	66.83	Site Flooded

TABLE 45. WATER QUALITY AND CHEMICAL ANALYSES COMPARISON OF RESULTS FOR STREAM SAMPLES

PARAMETER	UNITS	SPRING 2012 SITE 7. FELSENTHAL REFERENCE STREAM 5/6 - 5/10, 2012	SPRING 2012 SITE 1. COFFEE CREEK, BACKGROUND 5/6 - 5/10, 2012	SPRING 2012 SITE 2. COFFEE CREEK, BACKGROUND 2 5/6 - 5/10, 2012	SPRING 2012 SITE 3. INDIAN CREEK 5/6 - 5/10, 2012	SPRING 2012 SITE 4. COFFEE CREEK, BACKGROUND 3 5/6 - 5/10, 2012	SPRING 2012 SITE 5. COFFEE CREEK NEAR TRESTLE 5/6 - 5/10, 2012	SPRING 2012 SITE 9. COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 5/6 - 5/10, 2012
0.1	TT - 14 -	N. W.	70	200	120	400	1.000	500
Color Total Solids	Units	No Water	70 170	400	120 200	400	1,000 1,600	500 890
Total Solids Total Dissolved Solids	(mg/L)	No Water				530 420	1,600	890 870
	(mg/L)	No Water	110	300	140		,	
Total Suspended Solids	(mg/L)	No Water	32	95	33	60	51	10
Ortho-Phosphate as P	(mg/L)	No Water	0.046	0.039	0.058	0.18	0.15	0.25
Total Phosphorus	(mg/L)	No Water	0.14	0.36	0.16	1.0	1.4	0.690
BOD_5	(mg/L)	No Water	2.5	9.6	4.0	7.3	46.0	7.2
Copper	(mg/L)	No Water	0.025, 0.013	0.015	0.039	< 0.006	0.050	0.041
Zinc	(mg/L)	No Water	0.0080, 0.0089	0.0059	0.0120	0.0045	0.4700	0.8800
Chloride	(mg/L)	No Water	3.5	35	21	47	180	100
Hardness as CaCO3	(mg/L)	No Water	59, 53	140	57	200	290	160
Nitrate as N	(mg/L)	No Water	< 0.5	< 0.5	< 0.05	< 0.5	0.18	< 0.05
Sulfate	(mg/L)	No Water	3.1	12	12	4.4	340	180.0
Dieldrin	(μg/L)	No Water	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Fecal Coliform	CFU/100mL	No Water	34	1600	4.0	10	36	12
Dissolved Oxygen - Grab	(mg/L)	No Water	1.51 - 3.92	1.43 - 1.91	0.73 - 1.89	0.71 - 1.09	0.30 - 0.91	3.97 - 4.64
Dissolved Oxygen - Diurnal	(mg/L)	No Water	0.00 - 1.67	0.00 - 2.66	0.21 - 2.51	0.00 - 8.22	0.00 - 0.08	3.34 - 4.91
Dissolved Oxgen - % below acu	%	No Water	100%	98%	99%	70%	100%	0%
Temperature - Grab	(°C)	No Water	22.82 - 27.76	21.60 - 26.91	20.62 - 23.95	21.01 - 23.28	27.59 - 33.28	24.2 - 29.75
Temperature - Diurnal	(°C)	No Water	22.65 - 25.54	21.05 - 28.90	20.39 - 25.01	21.13 - 27.76	25.14 - 34.90	26.65 - 32.86
Conductivity - Grab	(mS/cm)	No Water	0.143 - 0.153	0.470 - 0.478	0.177 - 0.190	0.640 - 0.645	2.06 - 2.17	1.232 - 1.419
Conductivity - Diurnal	(mS/cm)	No Water	0.143 - 0.153	0.457 - 0.478	0.174 - 0.186	0.620 - 0.649	1.706 - 2.231	1.220 - 1.399
pH - Grab	(s.u.)	No Water	6.20 - 7.06	6.48 - 6.80	6.38 - 6.75	6.24 - 6.33	7.14 - 7.39	6.80 - 7.50
pH - Diurnal	(s.u.)	No Water	7.03 - 7.13	7.01 - 7.30	6.53 - 6.66	7.33 - 7.91	7.55 - 8.00	7.64 - 7.77
Turbidity - Grab	(ntu)	No Water	26.6	97.6	13.5	16.5	583	15.0
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TABLE 46. HABITAT QUALITY AND BIOLOGICAL ANALYSES RESULTS FOR STREAM ASSESSMENTS EVENT 3

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PARAMETER	UNITS	SPRING 2012 SITE 7. FELSENTHAL REFERENCE STREAM 5/6 - 5/10, 2012	SPRING 2012 SITE 1. COFFEE CREEK, BACKGROUND 5/6 - 5/10, 2012	SPRING 2012 SITE 2. COFFEE CREEK, BACKGROUND 2 5/6 - 5/10, 2012	SPRING 2012 SITE 3. INDIAN CREEK 5/6 - 5/10, 2012	SPRING 2012 SITE 4. COFFEE CREEK, BACKGROUND 3 5/6 - 5/10, 2012	SPRING 2012 SITE 5. COFFEE CREEK NEAR TRESTLE 5/6 - 5/10, 2012	SPRING 2012 SITE 9. COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 5/6 - 5/10, 2012
BIOLOGICAL ANALYSIS								
Sampling Method		None	D-Frame Dip Net	D-Frame Dip Net	D-Frame Dip Net	D-Frame Dip Net	D-Frame Dip Net	D-Frame Dip Net
Water Presence		None	Yes	Yes	Yes	Yes	Yes	Yes
Benthic Macroinvertebrate Community								
Density	#		200	126	198	282	51	259
Diversity	#		19	13	17	10	9	16
EPT Diversity	#		1	0	0	0	0	2
Dominant Functional								
Feeding Group	Class		Predator	Collector/Gatherer	Predator	Collector/Gatherer	Predator	Predator
Mean Tolerance Value	Scale		7.8	8	8.2	8.2	8	7.8
Dominant Species	Name		Chironomidae (Diptera	Chironomidae (Diptera	Asellidae (Isopoda)	Chironomidae (Diptera	Chironomidae (Diptera	Chironomidae (Diptera
HABITAT QUALITY*								
Method-RBP Low Gradient								
Epifuanal Substrate/ Available Cover	Scale 0-20	5	13	7	14	10	1	17
Pool Substrate Characterization	Scale 0-20	9	6	6	11	9	10	10
Pool Variability	Scale 0-20	5	15	5	7	5	11	14
Sediment Deposition	Scale 0-20	20	16	6	16	19	12	15
Channel Flow Status	Scale 0-20	5	20	5	7	16	18	20
Channel Alteration	Scale 0-20	20	20	13	20	20	9	15
Channel Sinuosity	Scale 0-20	15	18	10	10	10	6	14
Bank Stability (Sum LB/RB)	Scale 0-40	40	27	7	24	30	10	14
Riparian Vegetative Zone (Sum LB/RB)	Scale 0-40	40	35	37	38	40	36	35
Total Score	Scale 0-220	159	170	96	147	159	113	154
Comparability to Reference	%		106.92	60.38	92.45	100.00	71.07	96.86

TABLE 47. WATER QUALITY AND CHEMICAL ANALYSES COMPARISON OF RESULTS FOR STREAM SAMPLES

PARAMETER	UNITS	SUMMER 2012 SITE 7. FELSENTHAL REFERENCE STREAM 8/19 - 8/23, 2012	SUMMER 2012 SITE 1. COFFEE CREEK, BACKGROUND 8/19 - 8/23, 2012	SUMMER 2012 SITE 2. COFFEE CREEK, BACKGROUND 2 8/19 - 8/23, 2012	SUMMER 2012 SITE 3. INDIAN CREEK 8/19 - 8/23, 2012	SUMMER 2012 SITE 4. COFFEE CREEK, BACKGROUND 3 8/19 - 8/23, 2012	SUMMER 2012 SITE 5. COFFEE CREEK NEAR TRESTLE 8/19 - 8/23, 2012	SUMMER 2012 SITE 9. COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 8/19 - 8/23, 2012
Color	Units	No Water	50	No Water	No Water	No Water	600	500
Total Solids	(mg/L)	No Water	170	No Water	No Water	No Water	1,700	1,900
Total Dissolved Solids	(mg/L)	No Water	120	No Water	No Water	No Water	1,700	1,800
Total Suspended Solids	(mg/L)	No Water	35	No Water	No Water	No Water	21	23
Ortho-Phosphate as P	(mg/L)	No Water	< 0.02	No Water	No Water	No Water	1.1	1.1
Total Phosphorus	(mg/L)	No Water	0.063	No Water	No Water	No Water	2.4	1.3
BOD_5	(mg/L)	No Water	2.1	No Water	No Water	No Water	14	12
Copper	(mg/L)	No Water	< 0.006	No Water	No Water	No Water	0.0089 & 0.0096	< 0.006
Zinc	(mg/L)	No Water	0.0086	No Water	No Water	No Water	0.31 & 0.32	0.14
Chloride	(mg/L)	No Water	4.6	No Water	No Water	No Water	210	230
Hardness as CaCO3	(mg/L)	No Water	77	No Water	No Water	No Water	260	280
Nitrate as N	(mg/L)	No Water	< 0.05	No Water	No Water	No Water	< 0.05	< 0.05
Sulfate	(mg/L)	No Water	3.5	No Water	No Water	No Water	380	460
Dieldrin	(μg/L)	No Water	< 0.020	No Water	No Water	No Water	< 0.020	< 0.020
Fecal Coliform	CFU/100mL	No Water	950	No Water	No Water	No Water	3000	400
Dissolved Oxygen - Grab	(mg/L)	No Water	1.11 - 2.17	No Water	No Water	No Water	0.78 - 1.47	2.88 - 3.70
Dissolved Oxygen - Diurnal	(mg/L)	No Water	0.21 - 2.66	No Water	No Water	No Water	0.29 - 1.16	2.45 - 4.21
Dissolved Oxgen - % below acute standard	%	No Water	99%	No Water	No Water	No Water	100%	29%
Temperature - Grab	(°C)	No Water	23.96 - 25.04	No Water	No Water	No Water	24.06 - 30.46	25.01 - 26.50
Temperature - Diurnal	(°C)	No Water	22.67-25.06	No Water	No Water	No Water	23.96 - 33.31	25.04-30.50
Conductivity - Grab	(mS/cm)	No Water	0.108 - 0.175	No Water	No Water	No Water	2.29 - 2.30	2.45 - 2.48
Conductivity - Diurnal	(mS/cm)	No Water	0.174 - 0.178	No Water	No Water	No Water	2.365 - 2.468	2.457 - 2.528
pH - Grab	(s.u.)	No Water	5.68 - 5.35	No Water	No Water	No Water	7.32 - 7.77	8.03 - 8.05
pH - Diurnal	(s.u.)	No Water	7.05-7.12	No Water	No Water	No Water	7.87-7.99	8.11-8.31
Turbidity - Grab	(ntu)	No Water	126	No Water	No Water	No Water	27.2	68.7

SUMMER 2012

SUMMER 2012

PARAMETER	UNITS	SUMMER 2012 SITE 7. FELSENTHAL REFERENCE STREAM 8/19 - 8/23, 2012	SITE 1. COFFEE CREEK, BACKGROUND 8/19 - 8/23, 2012	SUMMER 2012 SITE 2. COFFEE CREEK, BACKGROUND 2 8/19 - 8/23, 2012	SITE 3. INDIAN CREEK 8/19 - 8/23, 2012	SUMMER 2012 SITE 4. COFFEE CREEK, BACKGROUND 3 8/19 - 8/23, 2012	SITE 5. COFFEE CREEK NEAR TRESTLE 8/19 - 8/23, 2012	SUMMER 2012 SITE 9. COFFEE CREEK, DOWNSTREAM FROM MOSSY LAKE 8/19 - 8/23, 2012
BIOLOGICAL ANALYSIS								
Sampling Method		None	Backpack EF	None	None	None	Fyke Nets	Fyke Nets
Water Presence		No	Yes	No	No	No	Yes	Yes
Fish Collected		No	Yes	No	No	No	Yes	Yes
Fish Community							* *	
Density	#		42				1	8
Diversity	#		8				1	5
Mean Weight	g		10.9				758	289.3
Mean Length	mm		70.5				558	257.7
Dom Species (DS)	Name		Lepomis macrochirus				Lepisosteus platostomus	Gambusia affinis
DS Abundance	#		20				1	3
DS Mean Weight	g		10.29				758	0.25
DS Mean Length	mm		58.35				558	21.7
Subdom Species (SS)	Name		Notropis atherinoides				NA	Dorosoma cepedianum
SS Abundance	#		9				NA	2
SS Mean Weight	g		4.5				NA	5
SS Mean Length	mm		73.4				NA	253
HABITAT QUALITY*								
Method-RBP Low Gradient								
Epifuanal Substrate/ Available Cover	Scale 0-20	1	6	6	6	6	11	18
Pool Substrate Characterization	Scale 0-20	15	13	6	11	11	11	14
Pool Variability	Scale 0-20	0	11	0	0	0	15	15
Sediment Deposition	Scale 0-20	20	11	16	18	18	1	16
Channel Flow Status	Scale 0-20	0	10	0	0	0	15	20
Channel Alteration	Scale 0-20	20	18	20	20	20	13	15
Channel Sinuosity	Scale 0-20	16	17	14	12	10	10	11
Bank Stability (Sum LB/RB)	Scale 0-40	39	17	34	34	40	24	34
Riparian Vegetative Zone (Sum LB/RB)	Scale 0-40	40	30	40	40	40	37	32
Total Score	Scale 0-220	151	133	136	141	145	137	175
Comparability to Reference	%		88.08	90.07	93.38	96.03	# 90.73	115.89
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SUMMER 2012

SUMMER 2012

SUMMER 2012

SUMMER 2012

SUMMER 2012

TABLE 49. COMPARISON OF WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR THE LAKES

PARAMETER	UNITS	SUMMER 2011 SITE 8. WILDCAT LAKE 9/11 - 9/15, 2011	SUMMER 2011 SITE 6. MOSSY LAKE 9/11 - 9/15, 2011
C.L.	Units	30	1.500
Color Total Solids			1,500
	(mg/L)	100	1,700
Total Dissolved Solids	(mg/L)	40	1,500
Total Suspended Solids	(mg/L)	9.6	12
Ortho-Phosphate as P	(mg/L)	< 0.02	1.1
Total Phosphorus	(mg/L)	0.036	1.4
BOD_5	(mg/L)	2.4	110
Copper	(mg/L)	< 0.006	0.0096
Zinc	(mg/L)	0.0041	0.26
Chloride	(mg/L)	4.8	200
Hardness as CaCO3	(mg/L)	-	-
Nitrate as N	(mg/L)	< 0.05	< 0.5
Sulfate	(mg/L)	7	360
Dieldrin	(µg/L)	< 0.002	< 0.002
Fecal Coliform	CFU/100mL	200	< 1
Dissolved Oxygen - Grab	(mg/L)	5.75 - 7.52	0.15 - 1.35
Dissolved Oxygen - Diurnal	(mg/L)	0.44 - 5.73	0.03 - 0.44
Dissolved Oxgen - % below acute standard	%	46%	100%
Temperature - Grab	(°C)	26.10 - 29.48	22.60 - 24.99
Temperature - Diurnal	(°C)	25.22 - 26.60	23.54 - 28.06
Conductivity - Grab	(mS/cm)	0.068 - 0.070	2.25 - 2.30
Conductivity - Diurnal	(mS/cm)	0.068 - 0.073	2.28 - 2.33
pH - Grab	(s.u.)	7.04 - 7.29	8.01 - 8.13
pH - Diurnal	(s.u.)	6.24 - 6.45	7.88 - 7.96
Turbidity - Grab	(ntu)	28.5	31.4
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TABLE 50. HABITAT QUALITY AND BIOLOGICAL ANALYSES RESULTS FOR LAKE ASSESSMENTS EVENT 1

PARAMETER	UNITS	SUMMER 2011 SITE 8. WILDCAT LAKE 9/11 - 9/15, 2011	SUMMER 2011 SITE 6. MOSSY LAKE 9/11 - 9/15, 2011
BIOLOGICAL ANALYSIS			
Sampling Method		Boat Electrofishing	Boat Electrofishing
Water Presence		Yes	Yes
Fish Collected		Yes	No
Fish Community		105	110
Density	#	` `	0
Diversity	#	14	Ů ·
Mean Weight	g	199.40	
Mean Length	mm	180.41	
Dom Species (DS)	Name	Lepomis macrochirus	
DS Abundance	#	30	
DS Mean Weight	g	13.1	
DS Mean Length	mm	90.03	
Subdom Species (SS)	Name	Dorosoma cepedianum	
SS Abundance	#	30	
SS Mean Weight	g	260.76	
SS Mean Length	mm	266.75	
HABITAT QUALITY*			
Method-RBP Low Gradient			
Epifuanal Substrate/ Available Cover	Scale 0-20	19	14
Pool Substrate Characterization	Scale 0-20	20	3
Pool Variability	Scale 0-20	20	3
Sediment Deposition	Scale 0-20	20	3
Channel Flow Status	Scale 0-20	20	3
Channel Alteration	Scale 0-20	20	2
Channel Sinuosity	Scale 0-20	13	8
Bank Stability (Sum LB/RB)	Scale 0-40	40	4
Riparian Vegetative Zone (Sum LB/RB)	Scale 0-40	40	40
Total Score	Scale 0-220	212	80
Comparability to Reference	%		38

TABLE 51. COMPARISON OF WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR THE LAKES

PARAMETER	UNITS	FALL 2011 SITE 8. WILDCAT LAKE 12/11 - 12/15, 2011	FALL 2011 SITE 6. MOSSY LAKE 12/11 - 12/15, 2011
C. L.	TT:://	100	200
Color	Units	100	200
Total Solids	(mg/L)	76	430
Total Dissolved Solids	(mg/L)	56	400
Total Suspended Solids	(mg/L)	16	10
Ortho-Phosphate as P	(mg/L)	0.026	0.2
Total Phosphorus	(mg/L)	0.03	0.24
BOD_5	(mg/L)	< 2	2.6
Copper	(mg/L)	< 0.006	< 0.006
Zinc	(mg/L)	0.0075	0.068
Chloride	(mg/L)	6.4	46
Hardness as CaCO3	(mg/L)	16.0	70
Nitrate as N	(mg/L)	0.34	0.25
Sulfate	(mg/L)	9.1	100
Dieldrin	(μg/L)	< 0.002	< 0.002
Fecal Coliform	CFU/100mL	63	92
Dissolved Oxygen - Grab	(mg/L)	7.38 - 8.73	0.13 - 7.87
Dissolved Oxygen - Diurnal	(mg/L)	8.83 - 9.90	1.99 - 8.51
Dissolved Oxgen - % below acute standard	%	0%	17%
Temperature - Grab	(°C)	7.25 - 8.41	6.43 - 9.07
Temperature - Diurnal	(°C)	7.08 - 8.44	6.30 - 8.93
Conductivity - Grab	(mS/cm)	0.066 - 0.069	0.608 - 1.74
Conductivity - Diurnal	(mS/cm)	0.061 - 0.070	0.285 - 1.219
pH - Grab	(s.u.)	6.38 - 6.75	7.33 - 7.62
pH - Diurnal	(s.u.)	7.54 - 7.76	6.42 - 6.94
Turbidity - Grab	(ntu)	24.5	16.9

TABLE 52. HABITAT QUALITY AND BIOLOGICAL ANALYSES RESULTS FOR LAKE ASSESSMENTS EVENT 2

PARAMETER	UNITS	FALL 2011 SITE 8. WILDCAT LAKE 12/11 - 12/15, 2011	FALL 2011 SITE 6. MOSSY LAKE 12/11 - 12/15, 2011
BIOLOGICAL ANALYSIS			
Sampling Method		D-Frame Dip Net	D-Frame Dip Net
Water Presence		Yes	Yes
Benthic Macroinvertebrate Community		103	103
Density Density	#	235	209
Diversity	#	16	17
EPT Diversity	#	3	0
Dominant Functional Feeding Group	Class	Collector/Gatherers	Shredders
Mean Tolerance Value	Scale	8.3	7.7
Dominant Species	Name	Naididae (Oligochaeta)	Scirtidae (Coleoptera)
HABITAT QUALITY* FDEP Lake Assessment			
Hydrology	Scale	Surface water inflow and outflow present, short to moderate water residence time	Impounded, artificially controlled
Color	Scale	Slight tannin stain	High color, poor visibility
Secchi	Scale	14	1
Vegetation Quality	Scale	20	13
Stormwater inputs	Scale	20	10
Bottom Substrate Quality	Scale	5	1
Lakeside Adverse Human Alterations	Scale	17	16
Upland Buffer Zone	Scale	19	16
Adverse Watershed Land Use	Scale	19	3
Total Score	Scale	114	60
Comparability to Reference	%		52.63

TABLE 53. COMPARISON OF WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR THE LAKES

PARAMETER	UNITS	SPRING 2012	SPRING 2012
		SITE 8. WILDCAT LAKE	SITE 6. MOSSY LAKE
		5/6 - 5/10, 2012	5/6 - 5/10, 2012
Color	Units	80	500
Total Solids	(mg/L)	110	880
Total Dissolved Solids	(mg/L)	77	830
Total Suspended Solids	(mg/L)	14	8.8
Ortho-Phosphate as P	(mg/L)	< 0.02	0.33
Total Phosphorus	(mg/L)	0.084	0.7
BOD_5	(mg/L)	< 2.0	5.2
Copper	(mg/L)	0.039	0.037
Zinc	(mg/L)	0.0061	0.0740
Chloride	(mg/L)	10	100
Hardness as CaCO3	(mg/L)	23.0	160
Nitrate as N	(mg/L)	< 0.05	< 0.05
Sulfate	(mg/L)	8.1	180
Dieldrin	$(\mu g/L)$	< 0.020	< 0.020
Fecal Coliform	CFU/100mL	6.0	24
Dissolved Oxygen - Grab	(mg/L)	4.95 - 9.38	0.33 - 1.54
Dissolved Oxygen - Diurnal	(mg/L)	4.32 - 8.50	0.00 - 1.80
Dissolved Oxgen - % below acute standard	%	0%	100%
Temperature - Grab	(°C)	25.04 - 27.67	20.75 - 29.74
Temperature - Diurnal	(°C)	23.71 - 31.55	26.26 - 28.98
Conductivity - Grab	(mS/cm)	0.091 - 0.097	1.206 - 1.392
Conductivity - Diurnal	(mS/cm)	0.088 - 0.095	1.216 - 1.478
pH - Grab	(s.u.)	645 - 6.62	6.55 - 7.08
pH - Diurnal	(s.u.)	-	7.48 - 7.57
Turbidity - Grab	(ntu)	10.8	16.1

TABLE 54. HABITAT QUALITY AND BIOLOGICAL ANALYSES RESULTS FOR LAKE ASSESSMENTS EVENT 3

PARAMETER	UNITS	SPRING 2012 SITE 8. WILDCAT LAKE 5/6 - 5/10, 2012	SPRING 2012 SITE 6. MOSSY LAKE 5/6 - 5/10, 2012
BIOLOGICAL ANALYSIS			
Sampling Method		D-Frame Dip Net	D-Frame Dip Net
Water Presence		Yes	Yes
Benthic Macroinvertebrate Community			
Density	#	297	250
Diversity	#	23	24
EPT Diversity	#	1	2
Dominant Functional Feeding Group	Class	Predators	Predators
Mean Tolerance Value	Scale	8	8
Dominant Species	Name	Dytiscidae (Coleoptera)	Chironomidae (Diptera)
HABITAT QUALITY* FDEP Lake Assessment			
Hydrology	Scale	outflow present, short to moderate water residence time	Impounded, artificially controlled
Color	Scale	Slight tannin stain	High color, poor visibility
Secchi	Scale	7	1
Vegetation Quality	Scale	18	12
Stormwater inputs	Scale	20	11
Bottom Substrate Quality	Scale	17	7
Lakeside Adverse Human Alterations	Scale	20	15
Upland Buffer Zone	Scale	20	14
Adverse Watershed Land Use	Scale	17	15
Total Score	Scale	119	75
Comparability to Reference	%		63.03

TABLE 55. COMPARISON OF WATER QUALITY AND CHEMICAL ANALYSES RESULTS FOR THE LAKES

PARAMETER	UNITS	SUMMER 2012 SITE 8. WILDCAT LAKE 8/19 - 8/23, 2012	SUMMER 2012 SITE 6. MOSSY LAKE 8/19 - 8/23, 2012
Color	Units	45	1,000
Total Solids	(mg/L)	110	1,800
Total Dissolved Solids	(mg/L)	60	1,800
Total Suspended Solids	(mg/L)	12	22
Ortho-Phosphate as P	(mg/L)	< 0.02	1.1
Total Phosphorus	(mg/L)	0.02	1.3
BOD ₅	(mg/L)	2.5	1.5
-			
Copper	(mg/L)		< 0.006
Zinc	(mg/L)	0.0070	0.18
Chloride	(mg/L)	8.2	230
Hardness as CaCO3	(mg/L)	19.0	290
Nitrate as N	(mg/L)	< 0.05	< 0.05
Sulfate	(mg/L)	6.6	460
Dieldrin	(μg/L)	< 0.020	< 0.020
Fecal Coliform	CFU/100mL	110	1,600
Dissolved Oxygen - Grab	(mg/L)	4.59 - 6.13	0.10 - 0.47
Dissolved Oxygen - Diurnal	(mg/L)	4.37 - 8.16	0.07 - 1.63
Dissolved Oxgen - % below acute standard	%	0%	100%
Temperature - Grab	(°C)	27.51 - 28.75	25.10 - 29.11
Temperature - Diurnal	(°C)	26.75-30.84	25.24-30.88
Conductivity - Grab	(mS/cm)	0.073 - 0.078	1.33 - 2.47
Conductivity - Diurnal	(mS/cm)	0.071 - 0.085	2.509 - 2.560
pH - Grab	(s.u.)	6.56 - 7.54	7.97 - 10.41
pH - Diurnal	(s.u.)	6.59-7.27	8.07-8.41
Turbidity - Grab	(ntu)	19.7	45.0

TABLE 56. HABITAT QUALITY AND BIOLOGICAL ANALYSES RESULTS FOR LAKE ASSESSMENTS EVENT 4

Nets, Mini-fyke Nets Nets, Mini-fyke Nets				
Biological Analysis Boat Electrofishing, Experimental Gill Net, Fyke Nets, Mini-fyke Nets Nets, Mini-fyke Nets, Mini-fyke Nets Nets, Mini-fyke Nets, Mini-fyke Nets Nets, Mini-fyke Ne	PARAMETER	UNITS		
Boat Electrofishing, Experimental Gill Net, Fyke Nets Nets, Mini-fyke Nets Yes Yes Yes Sirish Collected Yes Yes Yes Yes Yes Sirish Collected Yes Yes Yes Yes Yes Sirish Collected Yes			8/19 - 8/23, 2012	8/19 - 8/23, 2012
Boat Electrofishing, Experimental Gill Net, Fyke Nets Nets, Mini-fyke Nets Yes Yes Yes Sirish Collected Yes Yes Yes Yes Yes Sirish Collected Yes Yes Yes Yes Yes Sirish Collected Yes	RIOLOGICAL ANALYSIS			
Experimental Gill Net, Fyke Nets, Mini-fyke Nets Nets, Mini-fyke Nets Nets, Mini-fyke Nets Nets, Mini-fyke Nets Yes Fish Collected Yes Yes Yes Fish Collected Yes Yes Yes Fish Community	DIOLOGICAL MINILIBIS		Boat Electrofishing	Boat Electrofishing
Fish Collected Yes Yes Fish Community	Sampling Method		Experimental Gill Net, Fyke	Experimental Gill Net, Fyke
Presity	Water Presence		Yes	
Density	Fish Collected		Yes	Yes
Density	Fish Community			* *
Mean Weight g 264.2 548 Mean Length mm 170.9 481.8 Dom Species (DS) Name Lepomis macrochirus Lepisosteus oculatus DS Abundance # 53 2 DS Mean Weight g 8.42 793.8 DS Mean Length mm 63.30 568.5 Subdom Species (SS) Name Dorosoma cepedianum NA SS Abundance # 42 NA SS Mean Weight g 194.80 NA SS Mean Length mm 259.10 NA HABITAT QUALITY* FDEP Lake Assessment Surface water inflow and outflow present, short to moderate water residence time Impounded, artificially controlled Color Scale Siight tannin stain High color, poor visibility Secchi Scale 13 3 Vegetation Quality Scale 20 3 Stormwater inputs Scale 17 3 Bottom Substrate Quality Scale 17 3	·	#	160	4
Mean Length mm 170.9 481.8 Dom Species (DS) Name Lepomis macrochirus Lepisosteus oculatus DS Abundance # 53 2 DS Mean Weight g 8.42 793.8 DS Mean Length mm 63.30 568.5 Subdom Species (SS) Name Dorosoma cepedianum NA SS Abundance # 42 NA SS Mean Weight g 194.80 NA SS Mean Length mm 259.10 NA HABITAT QUALITY* FDEP Lake Assessment Surface water inflow and outflow present, short to moderate water residence time Color Scale Slight tannin stain High color, poor visibility controlled Secchi Scale 13 3 Vegetation Quality Scale 20 3 Stormwater inputs Scale 0.2 0.15 Bottom Substrate Quality Scale 17 3 Lakeside Adverse Human Alterations Scale	Diversity	#	17	3
Mean Length mm 170.9 481.8 Dom Species (DS) Name Lepomis macrochirus Lepisosteus oculatus DS Abundance # 53 2 DS Mean Weight g 8.42 793.8 DS Mean Length mm 63.30 568.5 Subdom Species (SS) Name Dorosoma cepedianum NA SS Abundance # 42 NA SS Mean Weight g 194.80 NA SS Mean Length mm 259.10 NA HABITAT QUALITY* FDEP Lake Assessment Surface water inflow and outflow present, short to moderate water residence time Color Scale Slight tannin stain High color, poor visibility controlled Secchi Scale 13 3 Vegetation Quality Scale 20 3 Stormwater inputs Scale 0.2 0.15 Bottom Substrate Quality Scale 17 3 Lakeside Adverse Human Alterations Scale	Mean Weight	g	264.2	548
DS Abundance		mm	170.9	481.8
DS Abundance	-	Name	Lepomis macrochirus	Lepisosteus oculatus
DS Mean Length		#		
Name	DS Mean Weight	g	8.42	793.8
SS Abundance	DS Mean Length	mm	63.30	568.5
SS Mean Weight g	Subdom Species (SS)	Name	Dorosoma cepedianum	NA
SS Mean Length	SS Abundance	#	42	NA
HABITAT QUALITY* FIDEP Lake Assessment Surface water inflow and outflow present, short to moderate water residence time Color Scale Slight tannin stain High color, poor visibility Scale 13 3 Scale 13 3 Scale 20 3 Scormwater inputs Scale 20 3 Stormwater inputs Scale 0.2 0.15 Bottom Substrate Quality Scale 17 3 Lakeside Adverse Human Alterations Scale 19 16 Upland Buffer Zone Scale 20 20 Adverse Watershed Land Use Scale 18 15 Fotal Score Scale 127 75	SS Mean Weight	g	194.80	NA
Surface water inflow and outflow present, short to moderate water residence time Impounded, artificially controlled	SS Mean Length	mm	259.10	NA
Surface water inflow and outflow present, short to moderate water residence time Impounded, artificially controlled	HABITAT OUALITY*			
Hydrology	FDEP Lake Assessment			
Secchi Scale 13 3 Vegetation Quality Scale 20 3 Stormwater inputs Scale 0.2 0.15 Bottom Substrate Quality Scale 17 3 Lakeside Adverse Human Alterations Scale 19 16 Upland Buffer Zone Scale 20 20 Adverse Watershed Land Use Scale 18 15 Total Score Scale 127 75	Hydrology	Scale	outflow present, short to moderate water residence	•
Secchi Scale 13 3 Vegetation Quality Scale 20 3 Stormwater inputs Scale 0.2 0.15 Bottom Substrate Quality Scale 17 3 Lakeside Adverse Human Alterations Scale 19 16 Upland Buffer Zone Scale 20 20 Adverse Watershed Land Use Scale 18 15 Total Score Scale 127 75	Color	Scale	Slight tannin stain	High color, poor visibility
Stormwater inputs Scale 0.2 0.15 Bottom Substrate Quality Scale 17 3 Lakeside Adverse Human Alterations Scale 19 16 Upland Buffer Zone Scale 20 20 Adverse Watershed Land Use Scale 18 15 Total Score Scale 127 75	Secchi	Scale		3
Stormwater inputs Scale 0.2 0.15 Bottom Substrate Quality Scale 17 3 Lakeside Adverse Human Alterations Scale 19 16 Upland Buffer Zone Scale 20 20 Adverse Watershed Land Use Scale 18 15 Total Score Scale 127 75	Vegetation Quality	Scale	20	3
Lakeside Adverse Human Alterations Scale 19 16 Upland Buffer Zone Scale 20 20 Adverse Watershed Land Use Scale 18 15 Total Score Scale 127 75	Stormwater inputs	Scale	0.2	0.15
Upland Buffer Zone Scale 20 20 Adverse Watershed Land Use Scale 18 15 Fotal Score Scale 127 75	Bottom Substrate Quality	Scale	17	3
Adverse Watershed Land Use Scale 18 15 Fotal Score Scale 127 75	Lakeside Adverse Human Alterations	Scale	19	16
Total Score Scale 127 75	Upland Buffer Zone	Scale	20	20
7.0	Adverse Watershed Land Use	Scale	18	15
Comparability to Reference % 59.06	Total Score	Scale	127	75
	Comparability to Reference	%		59.06

FIGURES

Figure Numb	<u>ber</u> <u>Figure Title</u>	Page Number
Figure ES- 1	Sample Sites	142
Figure ES- 2	Coffee Creek at Site 2	
Figure 1	Location Map	
Figure 2	Topographic Map of Study Area	
Figure 3	Aerial Map of Study Area	
Figure 4	Topographic and Aerial Map of Site 1	
Figure 5	Photograph of Site 1	
Figure 6	Drainage Area of Site 1	
Figure 7	Topographic and Aerial Map of Site 2	150
Figure 8	Photograph of Site 2	
Figure 9	Drainage Area of Site 2	
Figure 10	Topographic and Aerial Map of Site 3	
Figure 11	Photograph of Site 3	
Figure 12	Drainage Area of Site 3	155
Figure 13	Topographic and Aerial Map of Site 4	
Figure 14	Photograph of Site 4	
Figure 15	Drainage Area of Site 4	158
Figure 16	Topographic and Aerial Map of Site 5	159
Figure 17	Photograph of Site 5	160
Figure 18	Drainage Area of Site 5	161
Figure 19	Topographic and Aerial Map of Site 6	162
Figure 20	Photograph of Site 6	163
Figure 21	Drainage Area of Site 6	164
Figure 22	Topographic and Aerial Map of Site 7	165
Figure 23	Photograph of Site 7	166
Figure 24	Drainage Area of Site 7	
Figure 25	Topographic and Aerial Map of Site 8	168
Figure 26	Photograph of Site 8	
Figure 27	Topographic and Aerial Map of Site 9	
Figure 28	Photograph of Site 9	
Figure 29	Drainage Area of Site 9	
Figure 30	Dissolved Oxygen and Temperature Data at Site 1 for September 2	
Figure 31	Dissolved Oxygen and Temperature Data at Site 2 for September 2	
Figure 32	Dissolved Oxygen and Temperature Data at Site 3 for September 2	
Figure 33	Dissolved Oxygen and Temperature Data at Site 4 for September 2	
Figure 34	Dissolved Oxygen and Temperature Data at Site 5 for September 2	
Figure 35	Dissolved Oxygen and Temperature Data at Site 6 for September 2	
Figure 36	Dissolved Oxygen and Temperature Data at Site 7 for September 2	
Figure 37	Dissolved Oxygen and Temperature Data at Site 8 for September 2	
Figure 38	Dissolved Oxygen and Temperature Data at Site 9 for September 2	
Figure 39	Dissolved Oxygen and Temperature Data at Site 1 for December 2	
Figure 40	Dissolved Oxygen and Temperature Data at Site 2 for December 2	
Figure 41	Dissolved Oxygen and Temperature Data at Site 3 for December 2	011184

Figure 42	Dissolved Oxygen and Temperature Data at Site 4 for December 2011	185
Figure 43	Dissolved Oxygen and Temperature Data at Site 5 for December 2011	186
Figure 44	Dissolved Oxygen and Temperature Data at Site 6 for December 2011	187
Figure 45	Dissolved Oxygen and Temperature Data at Site 7 for December 2011	188
Figure 46	Dissolved Oxygen and Temperature Data at Site 8 for December 2011	189
Figure 47	Dissolved Oxygen and Temperature Data at Site 9 for December 2011	190
Figure 48	Dissolved Oxygen and Temperature Data at Site 1 for May 2012	191
Figure 49	Dissolved Oxygen and Temperature Data at Site 2 for May 2012	192
Figure 50	Dissolved Oxygen and Temperature Data at Site 3 for May 2012	193
Figure 51	Dissolved Oxygen and Temperature Data at Site 4 for May 2012	194
Figure 52	Dissolved Oxygen and Temperature Data at Site 5 for May 2012	195
Figure 53	Dissolved Oxygen and Temperature Data at Site 6 for May 2012	196
Figure 54	Dissolved Oxygen and Temperature Data at Site 7 for May 2012	197
Figure 55	Dissolved Oxygen and Temperature Data at Site 8 for May 2012	198
Figure 56	Dissolved Oxygen and Temperature Data at Site 9 for May 2012	199
Figure 57	Dissolved Oxygen and Temperature Data at Site 1 for August 2012	200
Figure 58	Dissolved Oxygen and Temperature Data at Site 2 for August 2012	201
Figure 59	Dissolved Oxygen and Temperature Data at Site 3 for August 2012	202
Figure 60	Dissolved Oxygen and Temperature Data at Site 4 for August 2012	203
Figure 61	Dissolved Oxygen and Temperature Data at Site 5 for August 2012	204
Figure 62	Dissolved Oxygen and Temperature Data at Site 6 for August 2012	205
Figure 63	Dissolved Oxygen and Temperature Data at Site 7 for August 2012	206
Figure 64	Dissolved Oxygen and Temperature Data at Site 8 for August 2012	207
Figure 65	Dissolved Oxygen and Temperature Data at Site 9 for August 2012	208

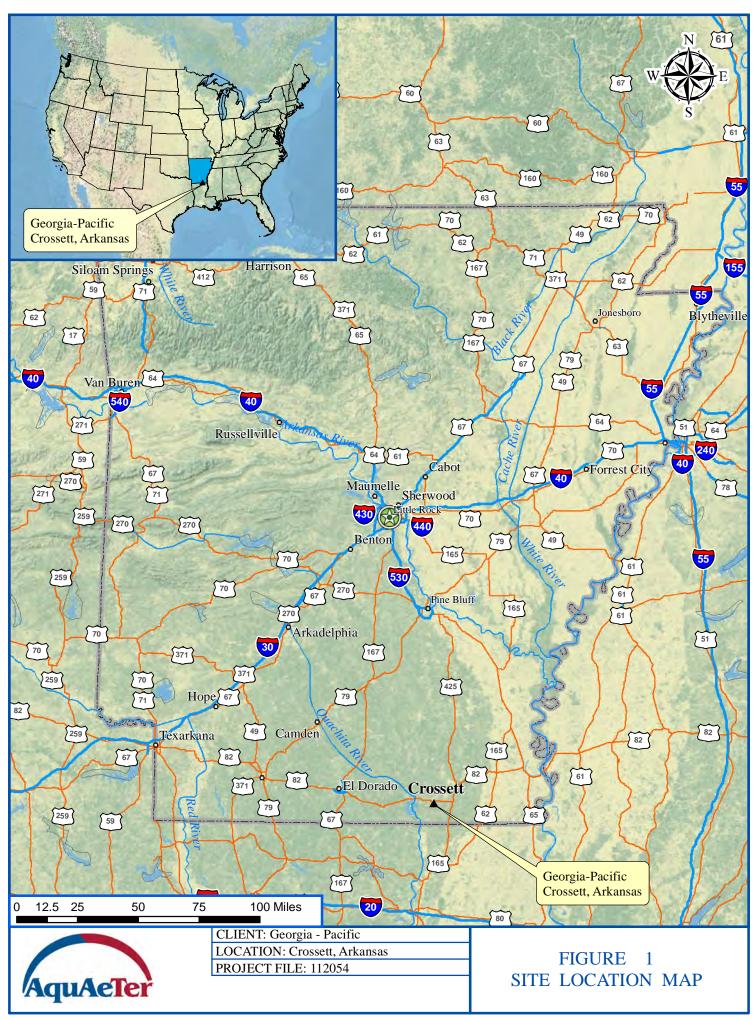


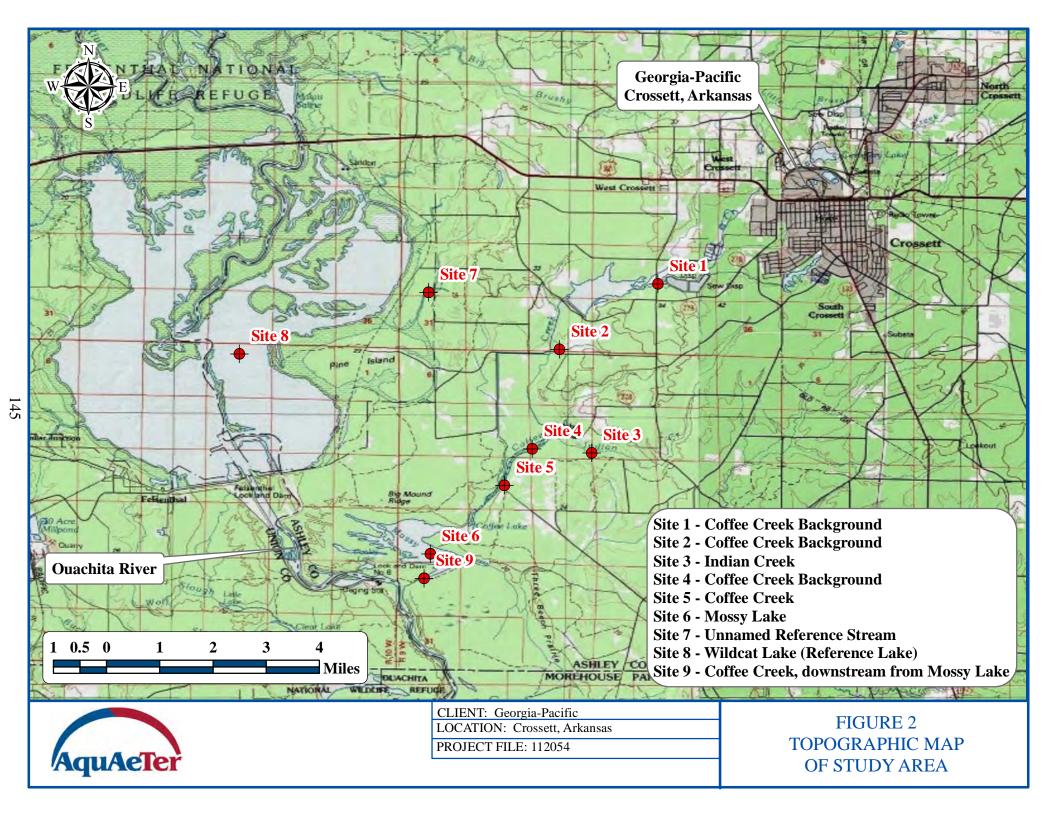


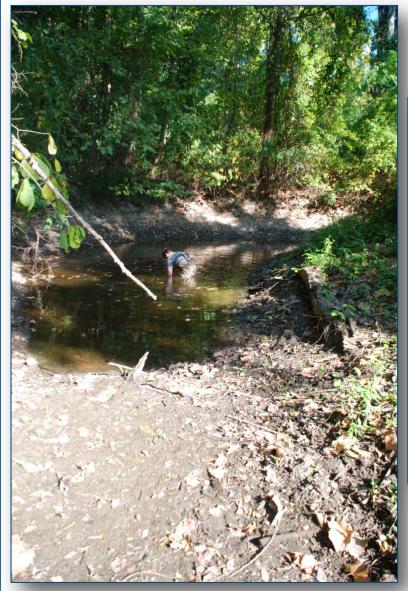
CLIENT: Georgia-Pacific LOCATION: Crossett, Arkansas PROJECT/FILE: 122154

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FIGURE ES-2. **COFFEE CREEK AT SITE 4 SEPTEMBER 2011**









View looking upstream from first pool at two upstream pools.

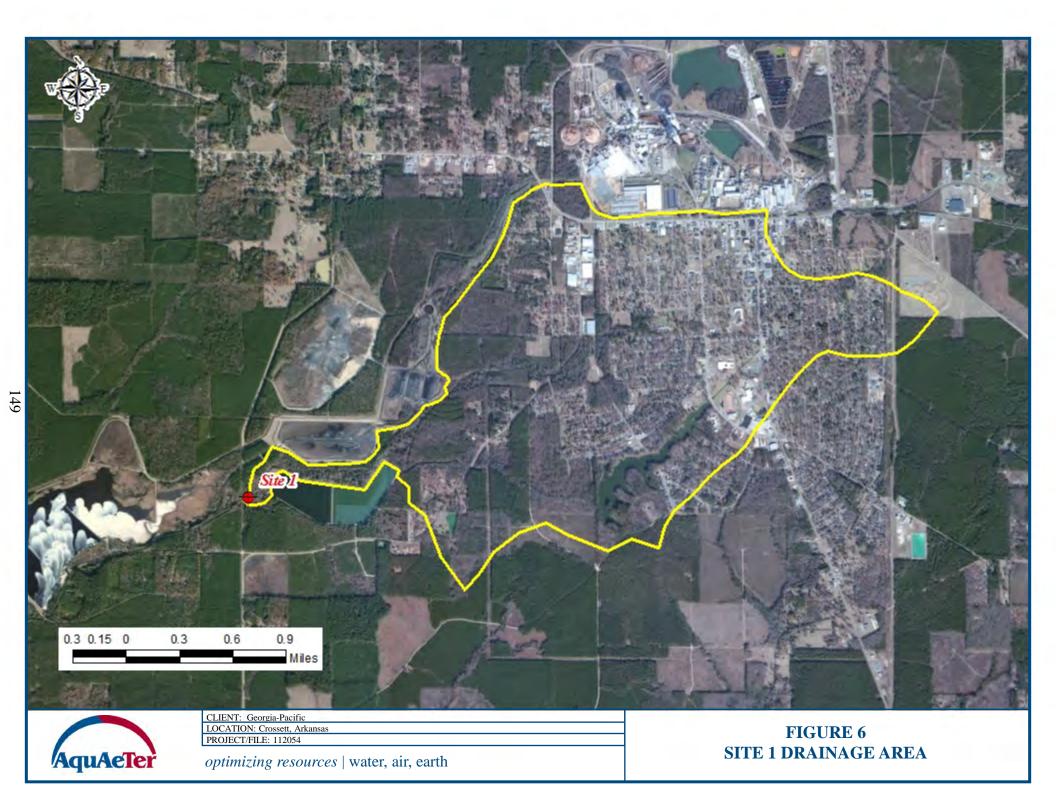
View looking upstream towards first pool.

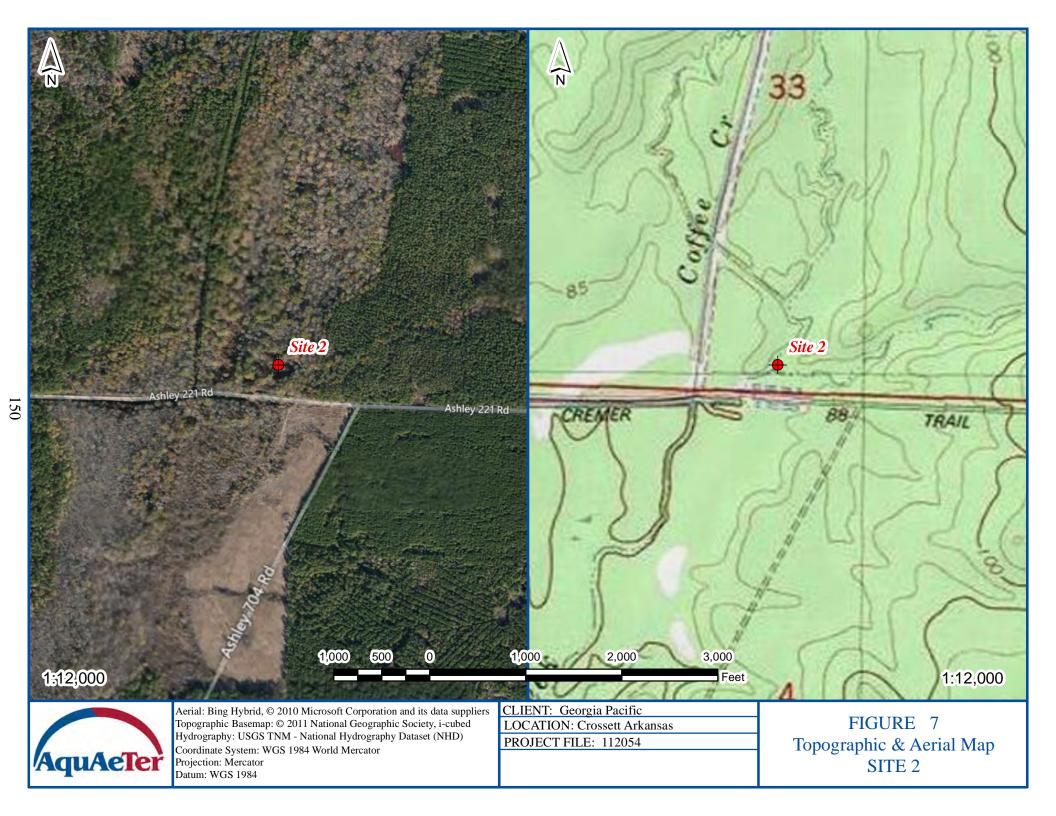


CLIENT: Georgia-Pacific LOCATION: Crossett, Arkansas PROJECT/FILE: 112054

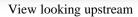
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FIGURE 5
SITE 1 REPRESENTATIVE PHOTOGRAPHS





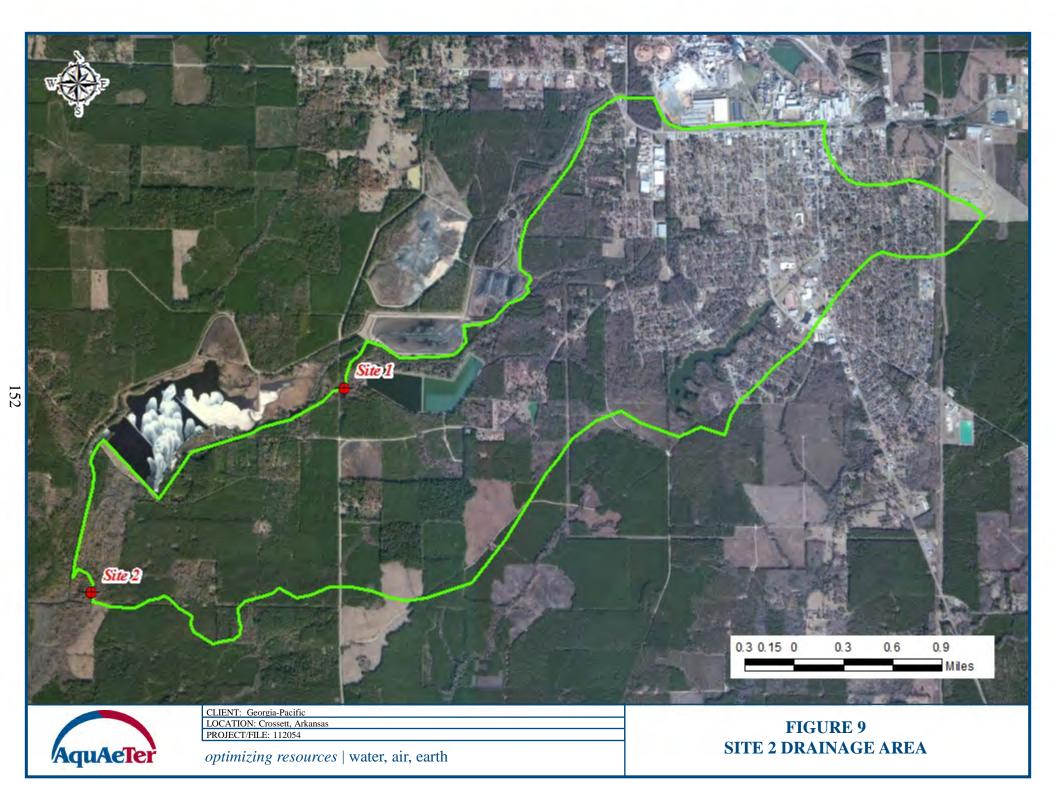






View looking upstream.







View of Indian Creek.

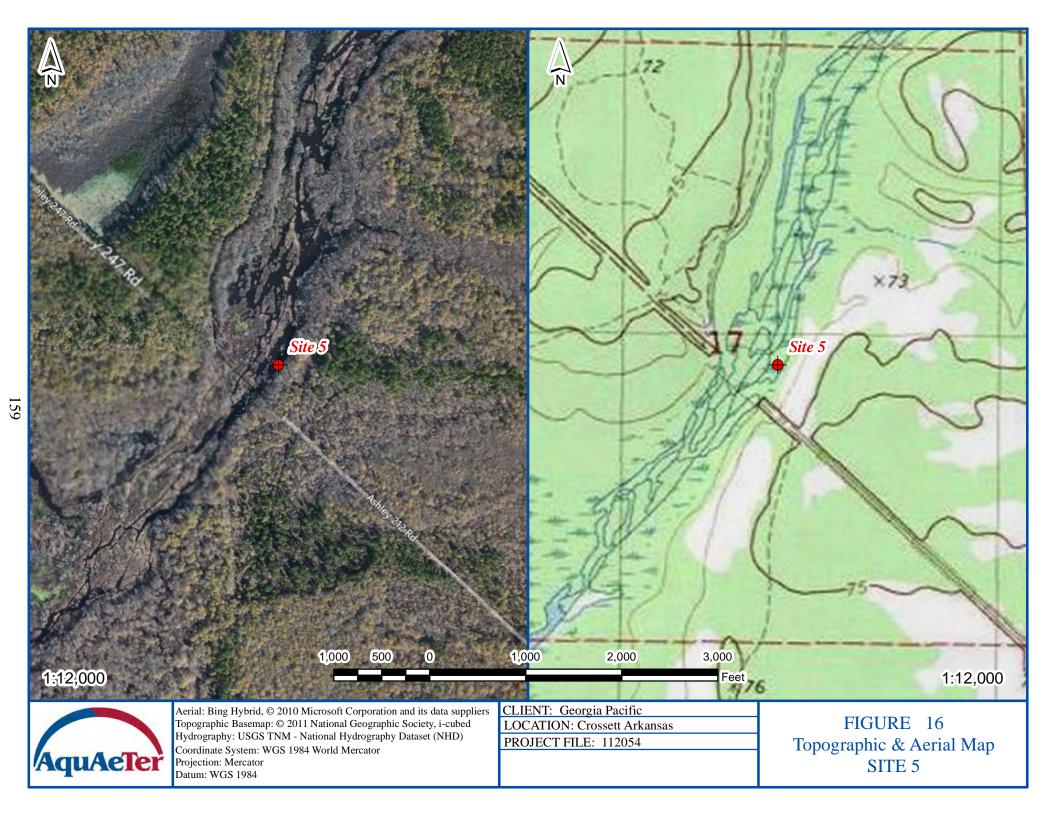


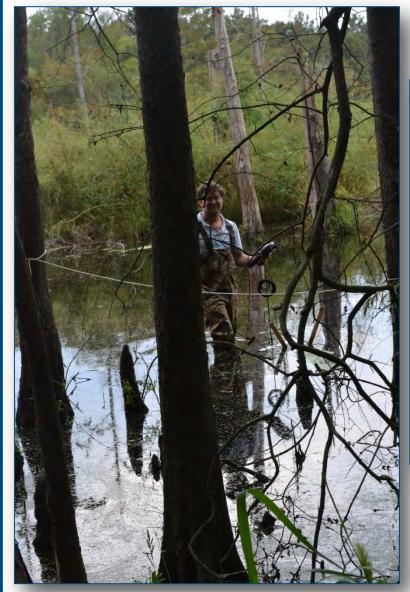
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FIGURE 14 SITE 4 REPRESENTATIVE PHOTOGRAPHS





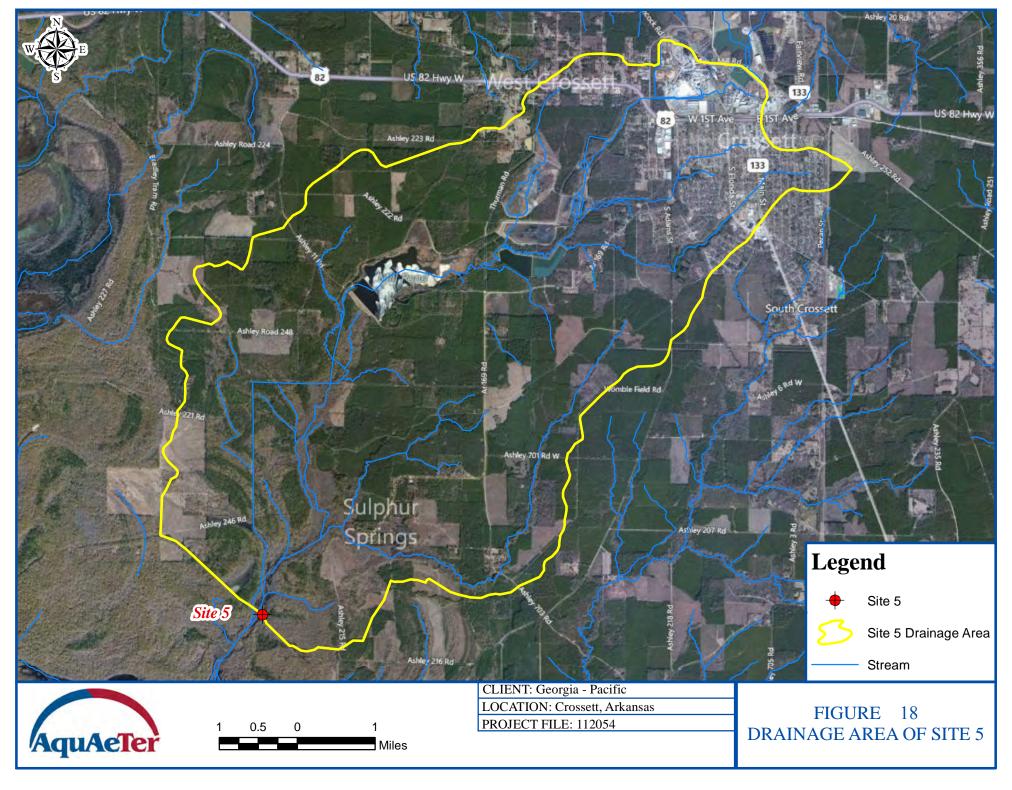
Coffee Creek at Sonde Location.

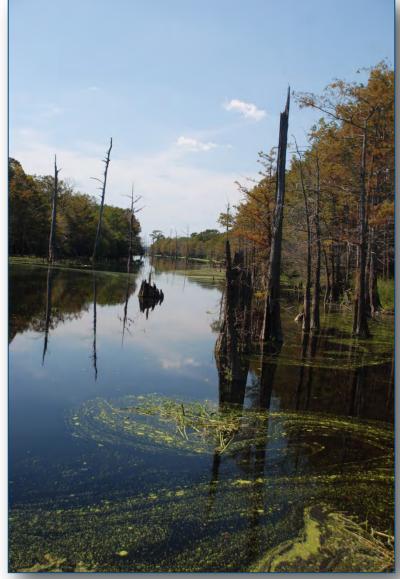


Coffee Creek with Georgia-Pacific effluent, facing upstream.



FIGURE 17 SITE 5 REPRESENTATIVE PHOTOGRAPHS





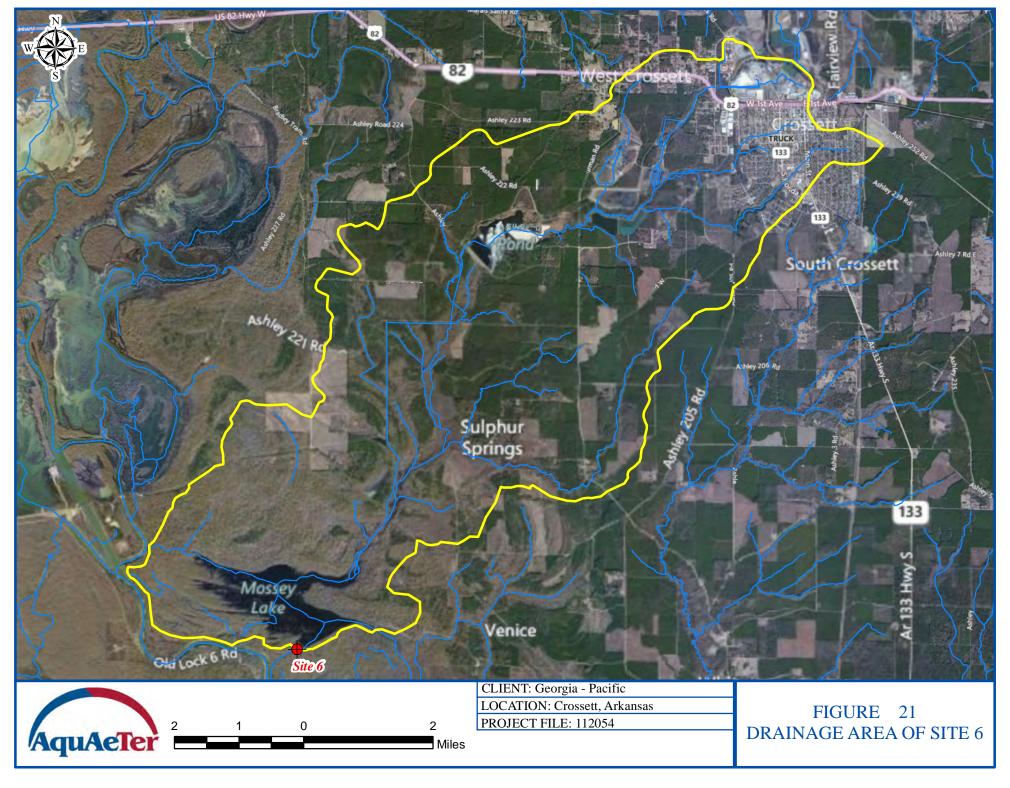


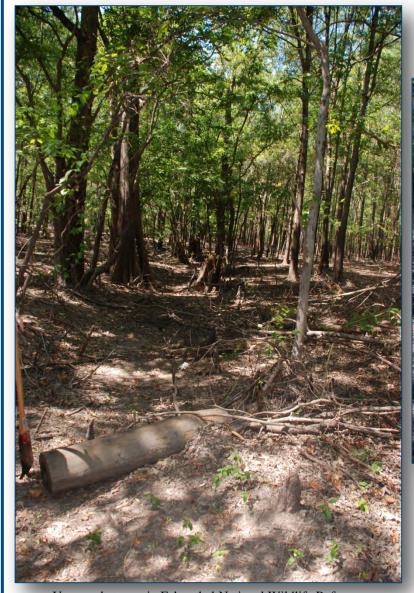
Mossy Lake, looking upstream from SMS 002.

Mossy Lake from boat launch, eastern corner.



FIGURE 20

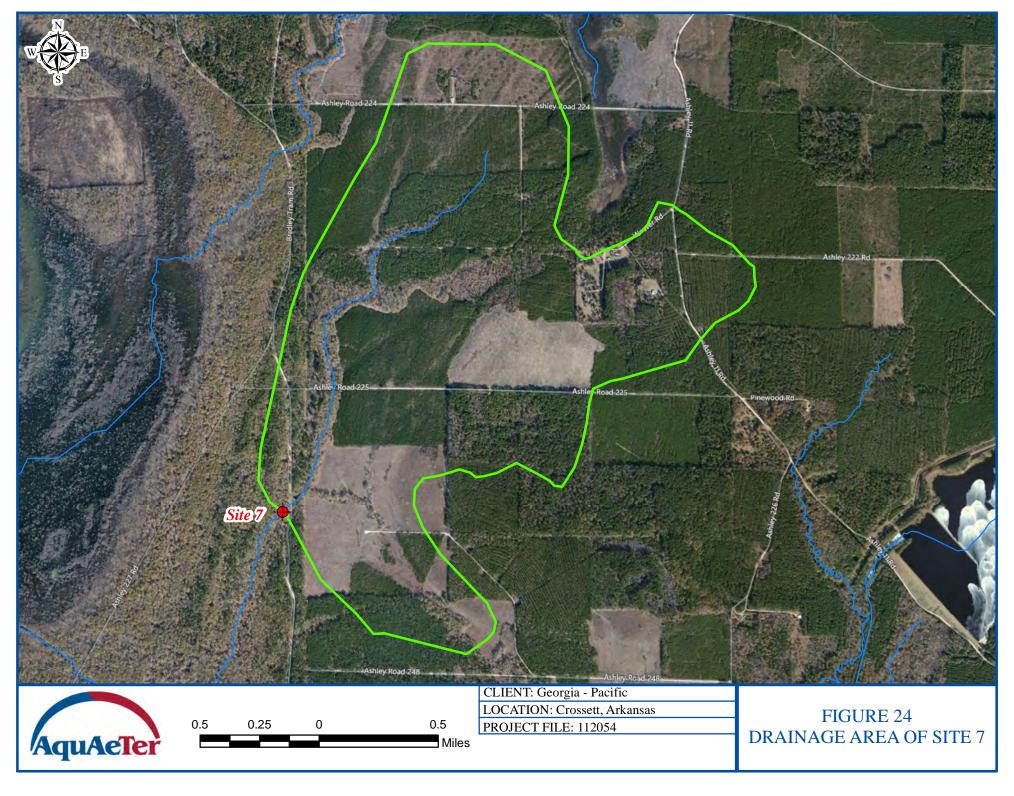




Unnamed stream in Felsenthal National Wildlife Refuge.

Unnamed stream in Felsenthal National Wildlife Refuge.





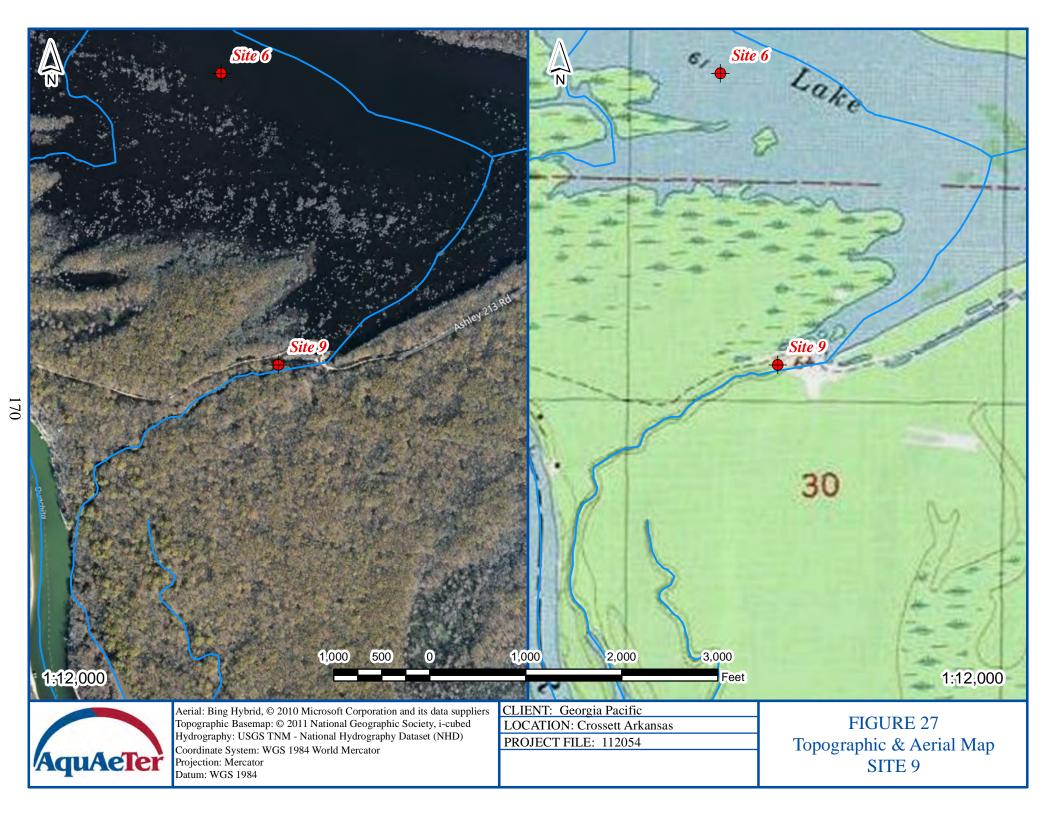


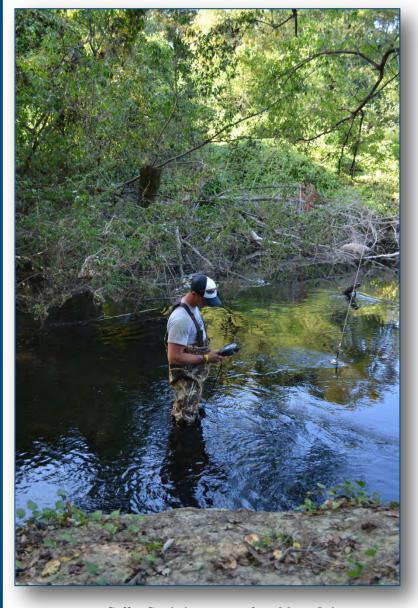


Wildcat Lake.

Wildcat Lake.





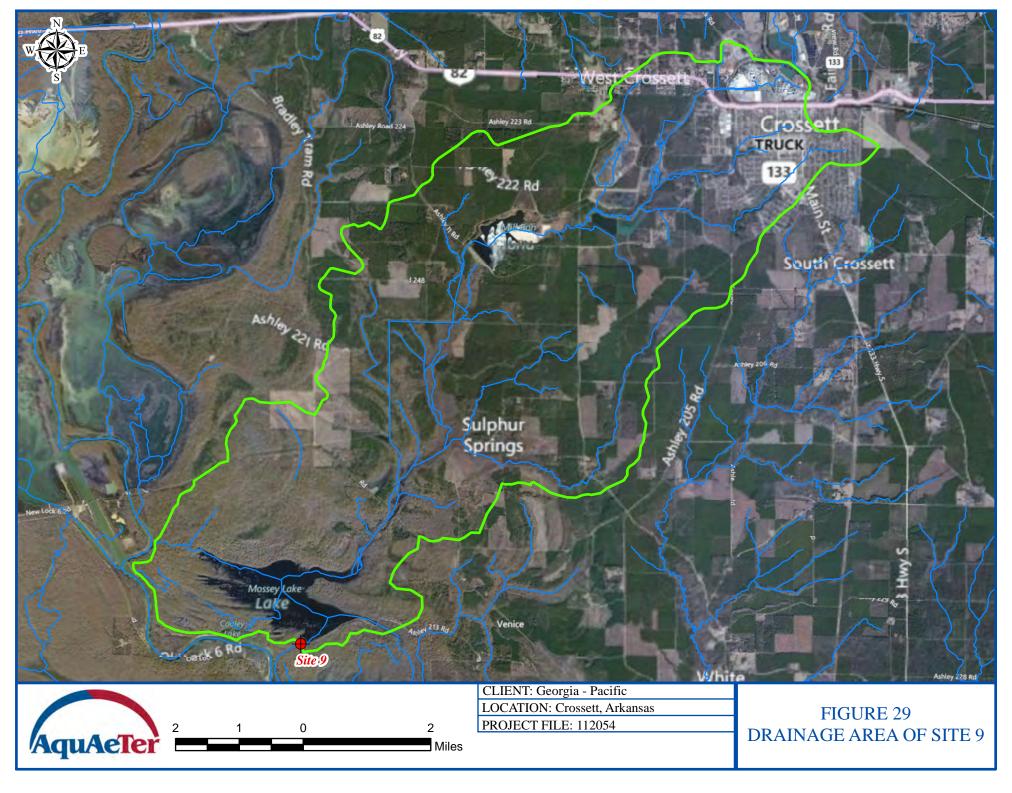


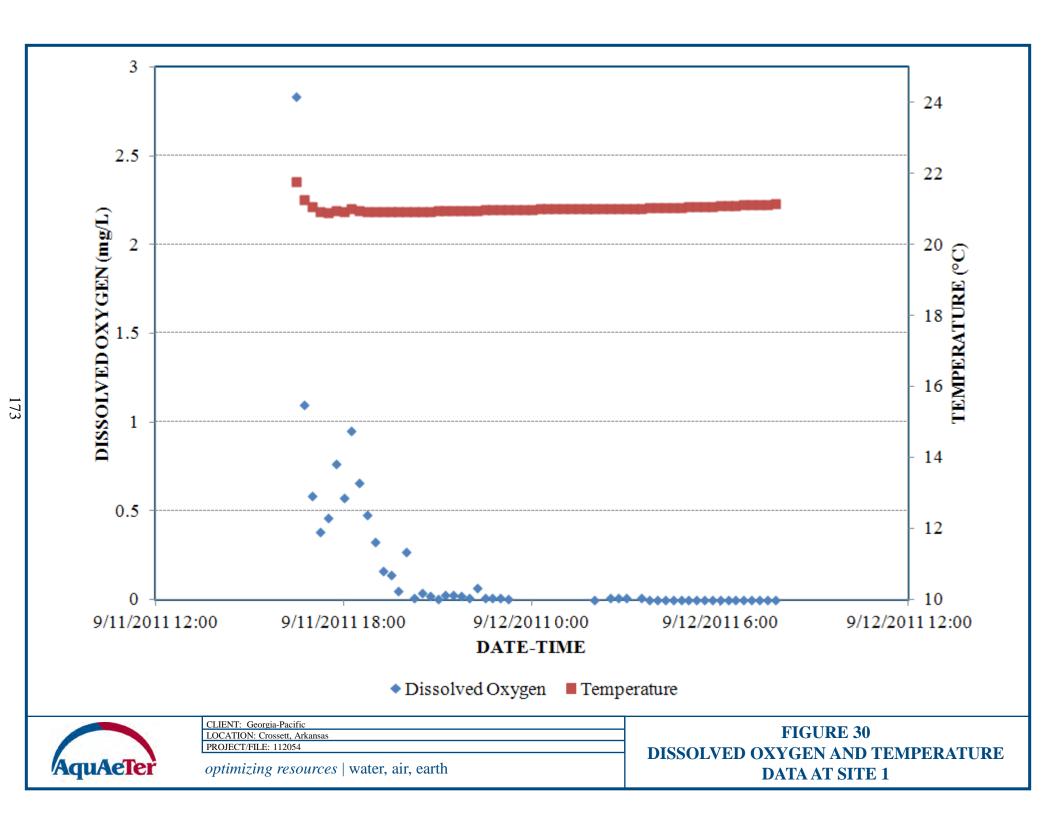


Coffee Creek downstream from Mossy Lake.

Coffee Creek downstream from Mossy Lake.









No water was present at Site 2 during the September 2011 sampling event. Therefore, no dissolved oxygen or water temperature were measured.



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FIGURE 31
DISSOLVED OXYGEN AND TEMPERATURE
DATA AT SITE 2



No water was present at Site 3 during the September 2011 sampling event. Therefore, no dissolved oxygen or water temperature were measured.



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FIGURE 32 DISSOLVED OXYGEN AND TEMPERATURE DATA AT SITE 3



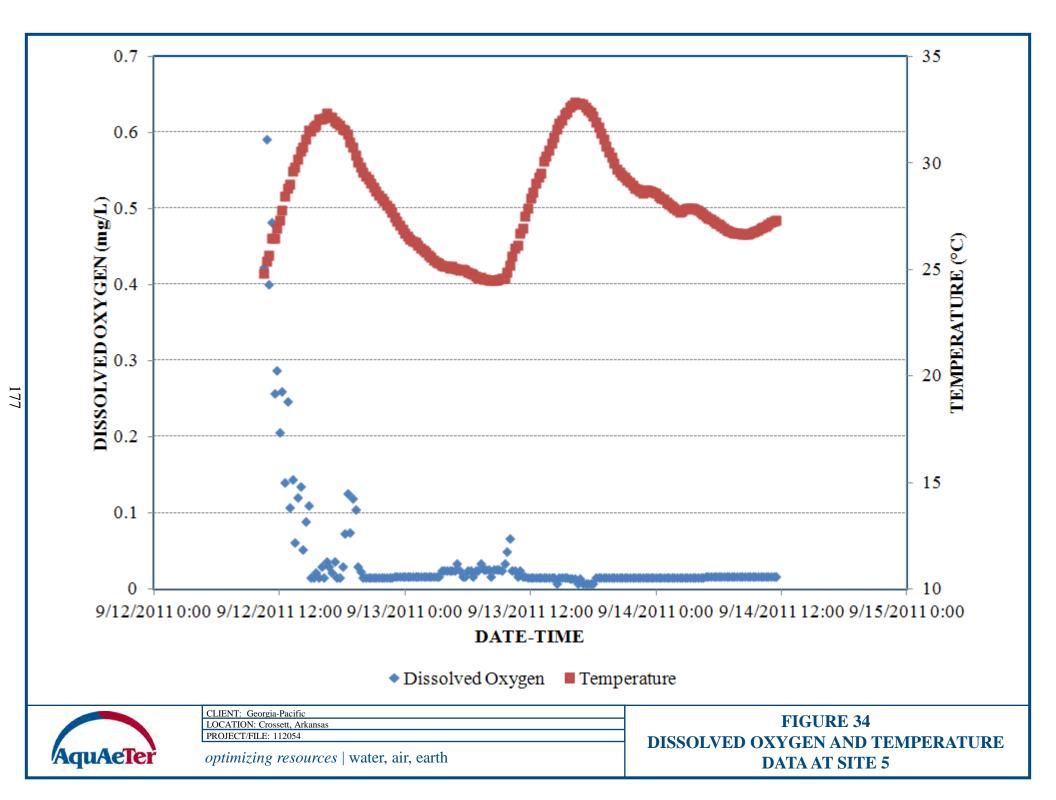
No water was present at Site 4 during the September 2011 sampling event. Therefore, no dissolved oxygen or water temperature were measured.

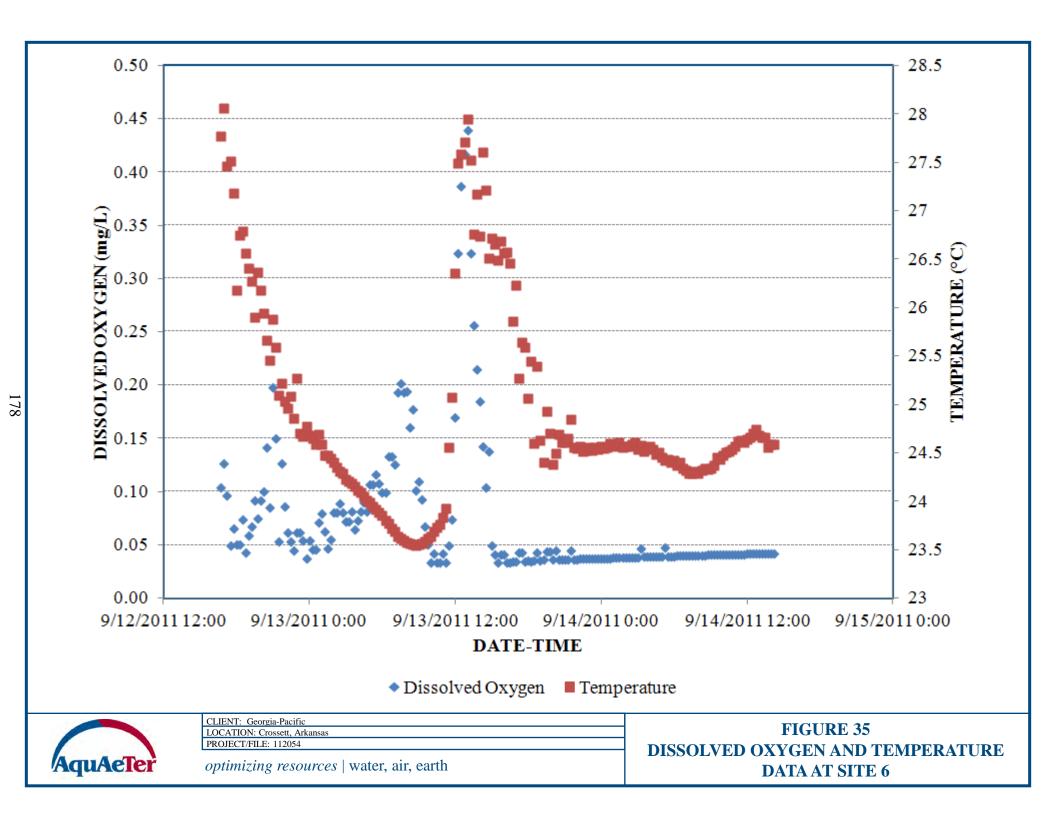


CLIENT: Georgia-Pacific LOCATION: Crossett, Arkansas PROJECT/FILE: 112054

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FIGURE 33
DISSOLVED OXYGEN AND TEMPERATURE
DATA AT SITE 4







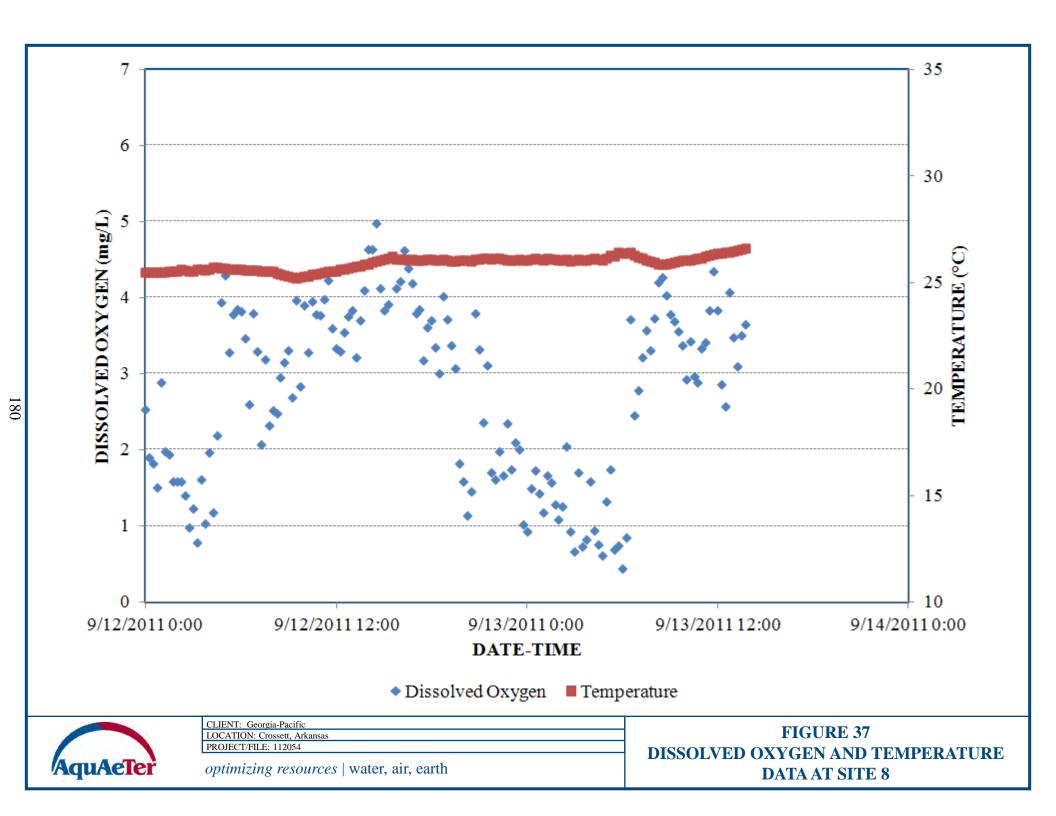
No water was present at Site 7 during the September 2011 sampling event. Therefore, no dissolved oxygen or water temperature were measured.

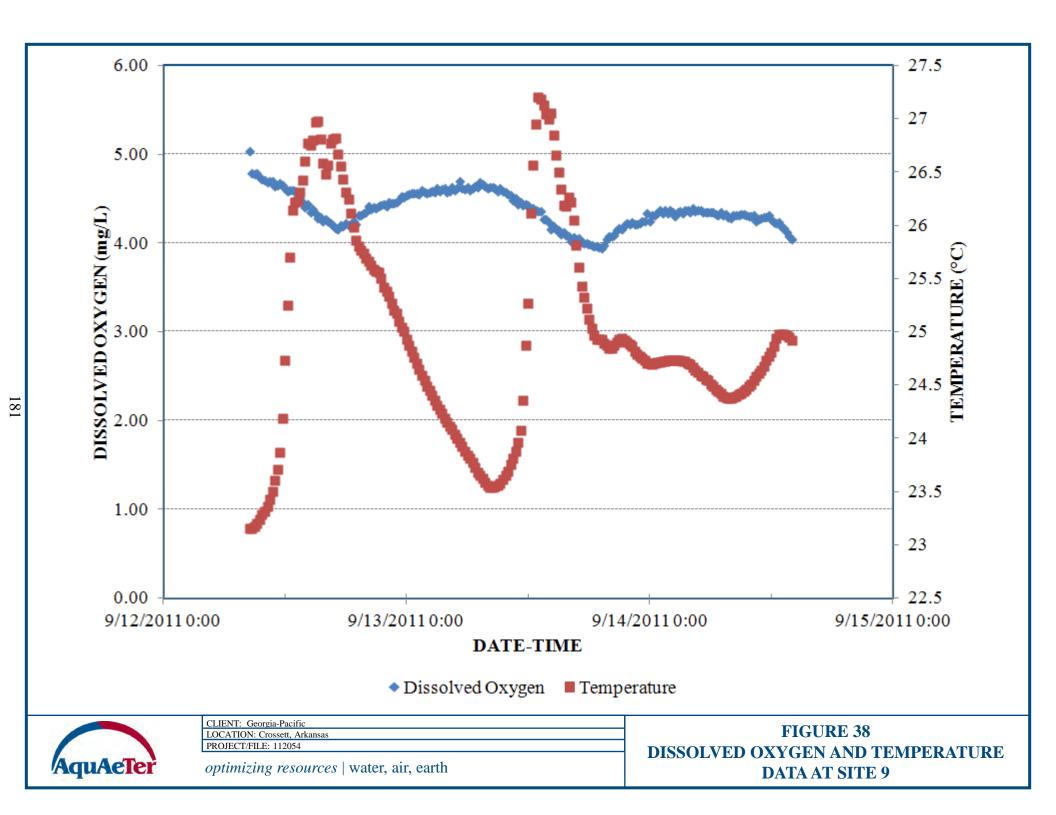


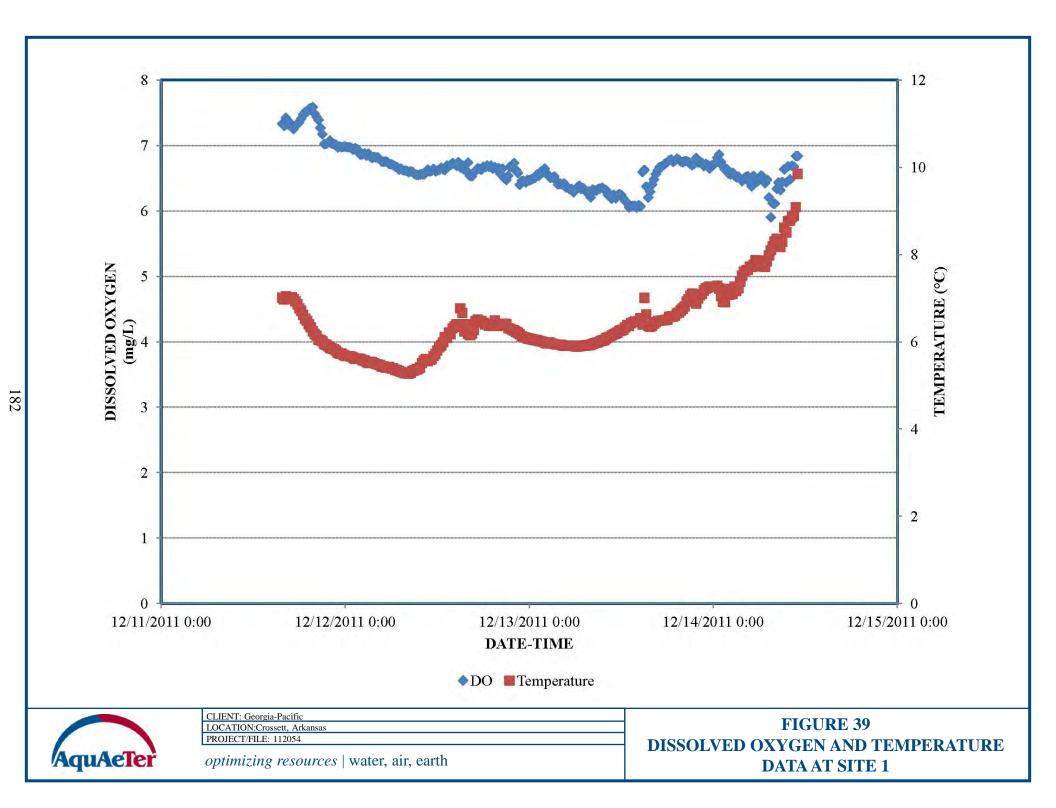
CLIENT: Georgia-Pacific LOCATION: Crossett, Arkansas PROJECT/FILE: 112054

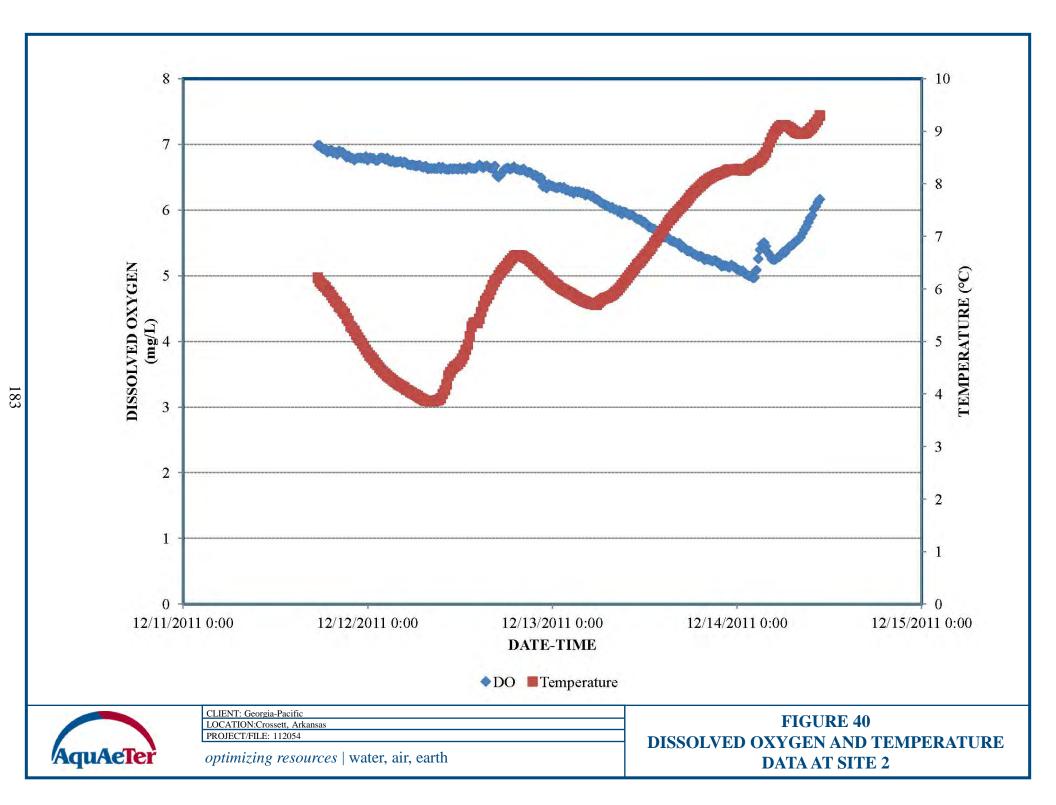
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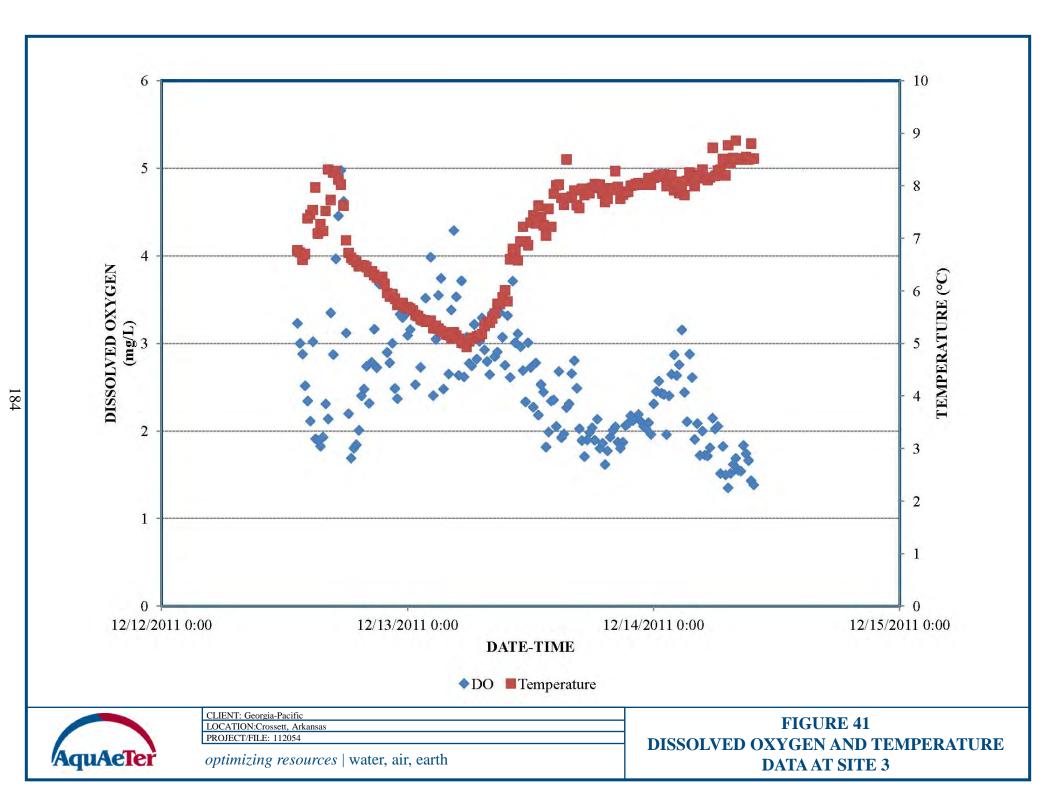
FIGURE 36
DISSOLVED OXYGEN AND TEMPERATURE
DATA AT SITE 7

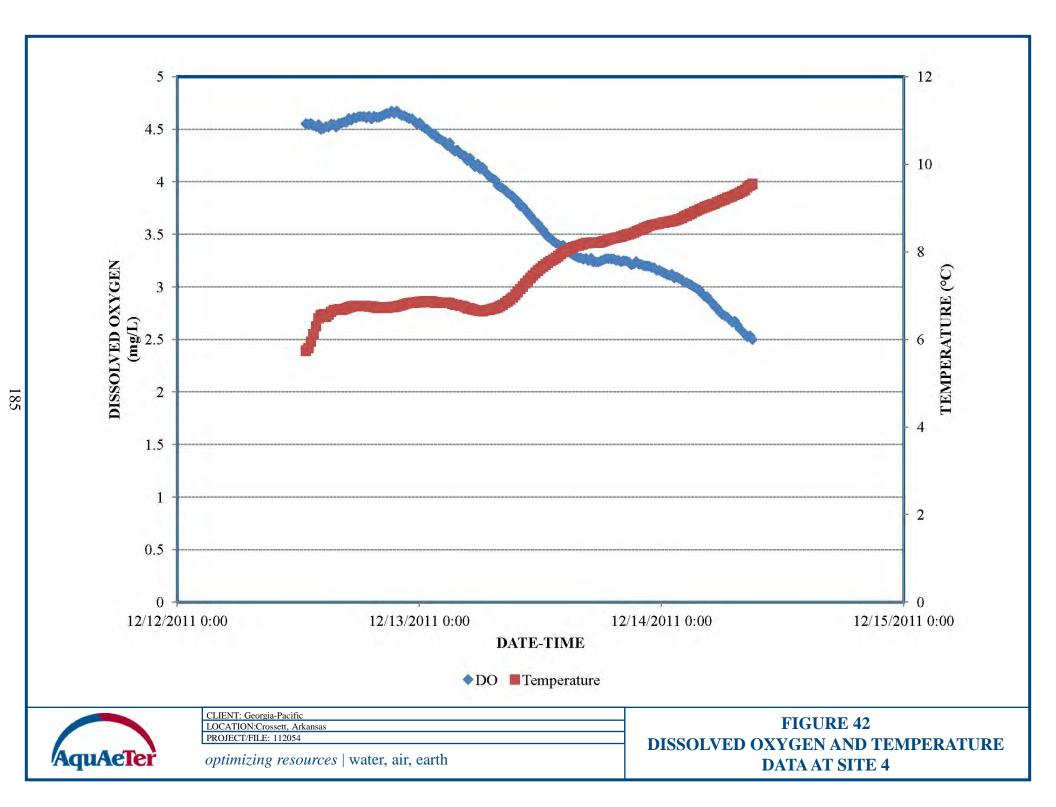


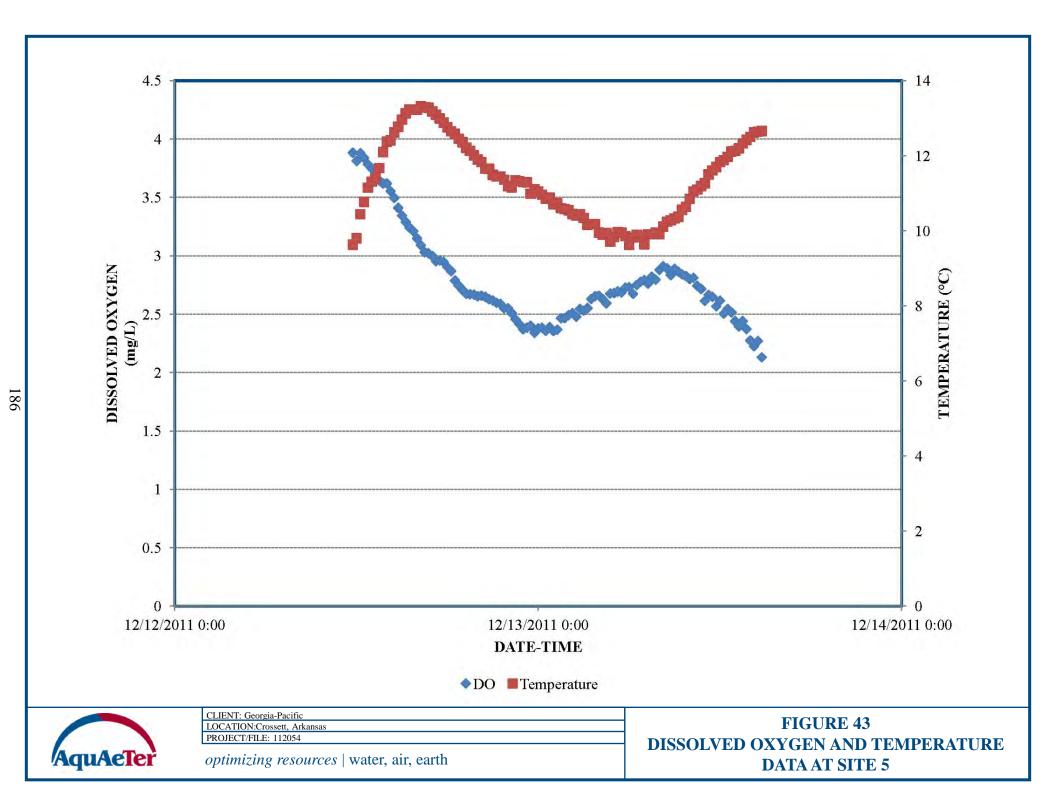


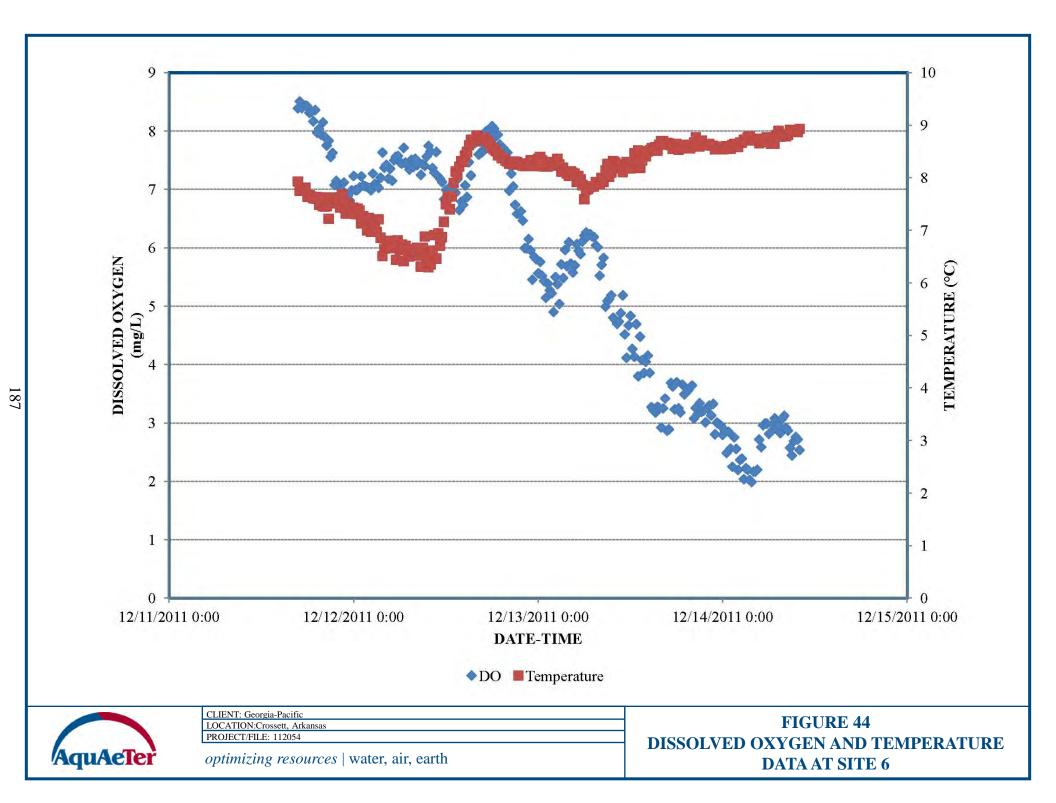


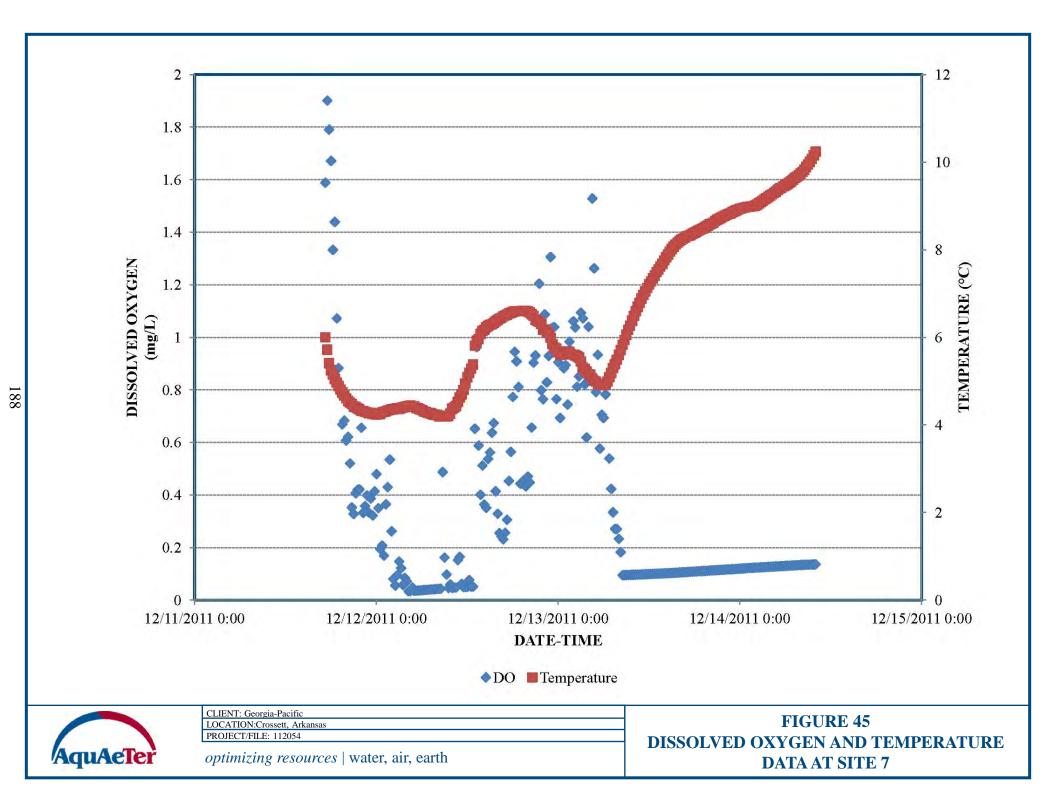


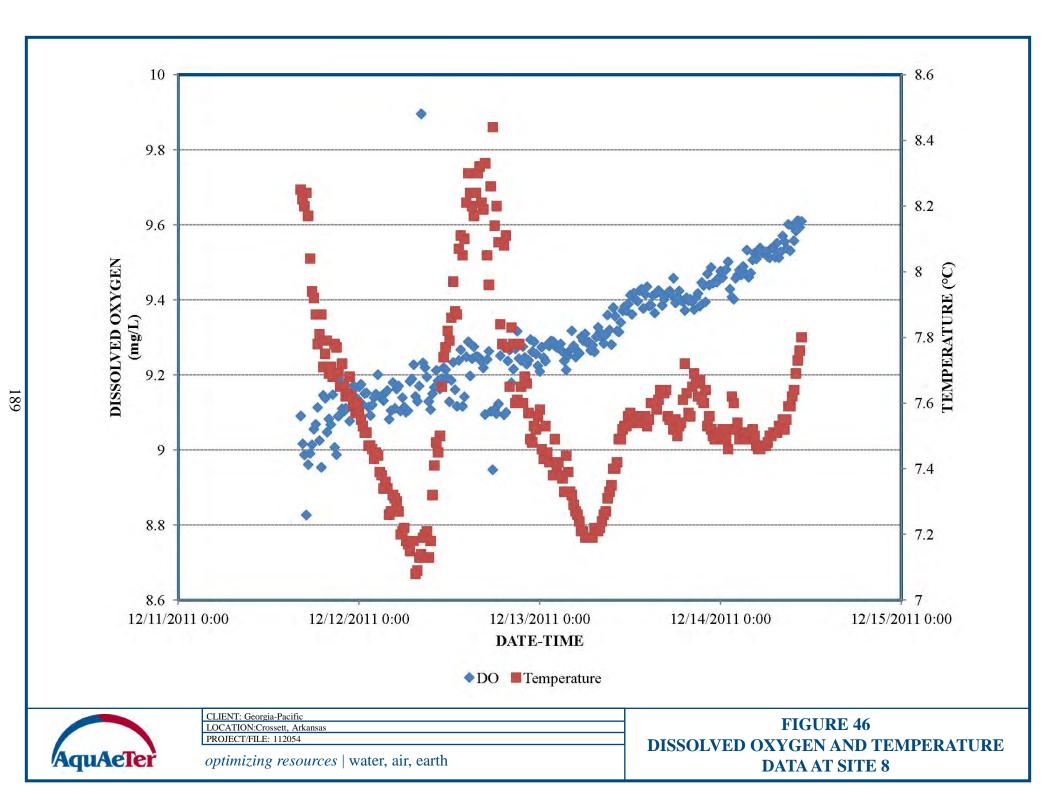














Site 9 was part of the Ouachita River during this sampling event. Therefore, dissolved oxygen and water temperature of Coffee Creek was unable to be measured at this station.



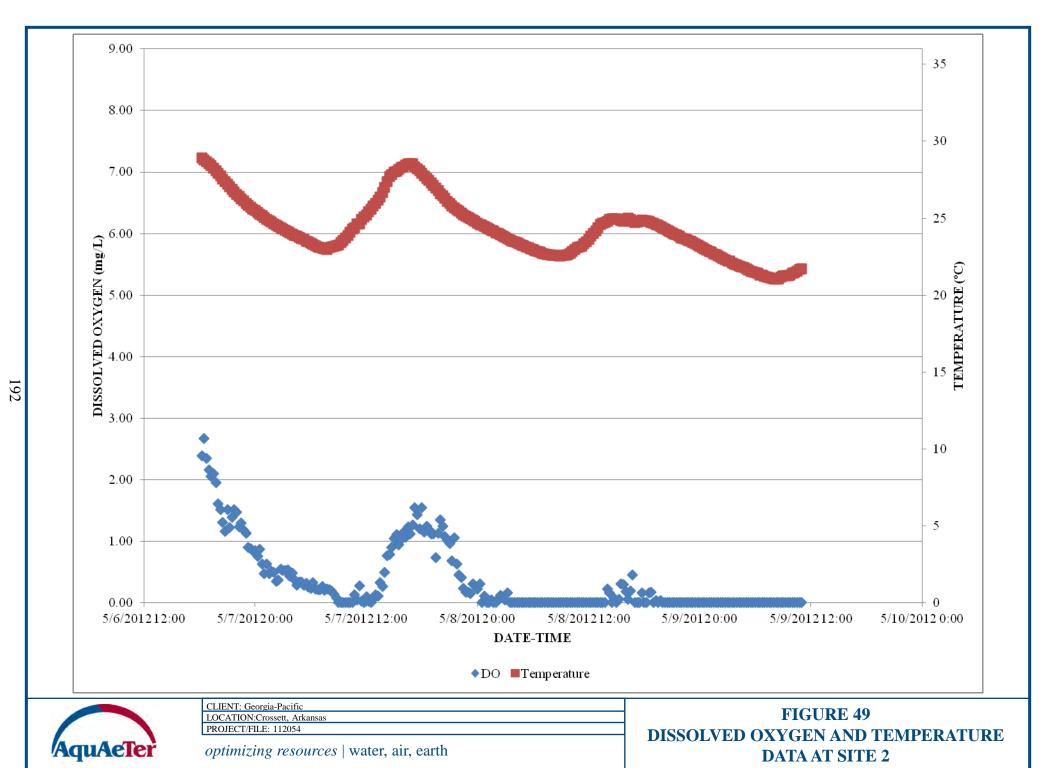
CLIENT: Georgia-Pacific
LOCATION: Crossett, Arkansas
PROJECT/FILE: 112054

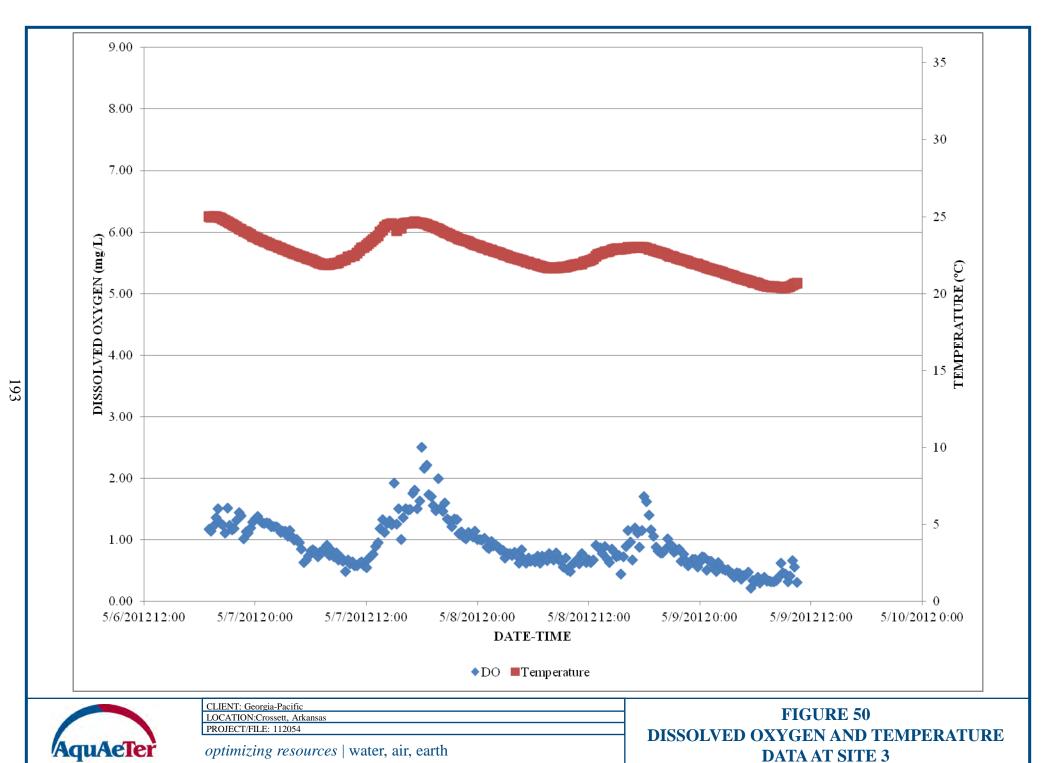
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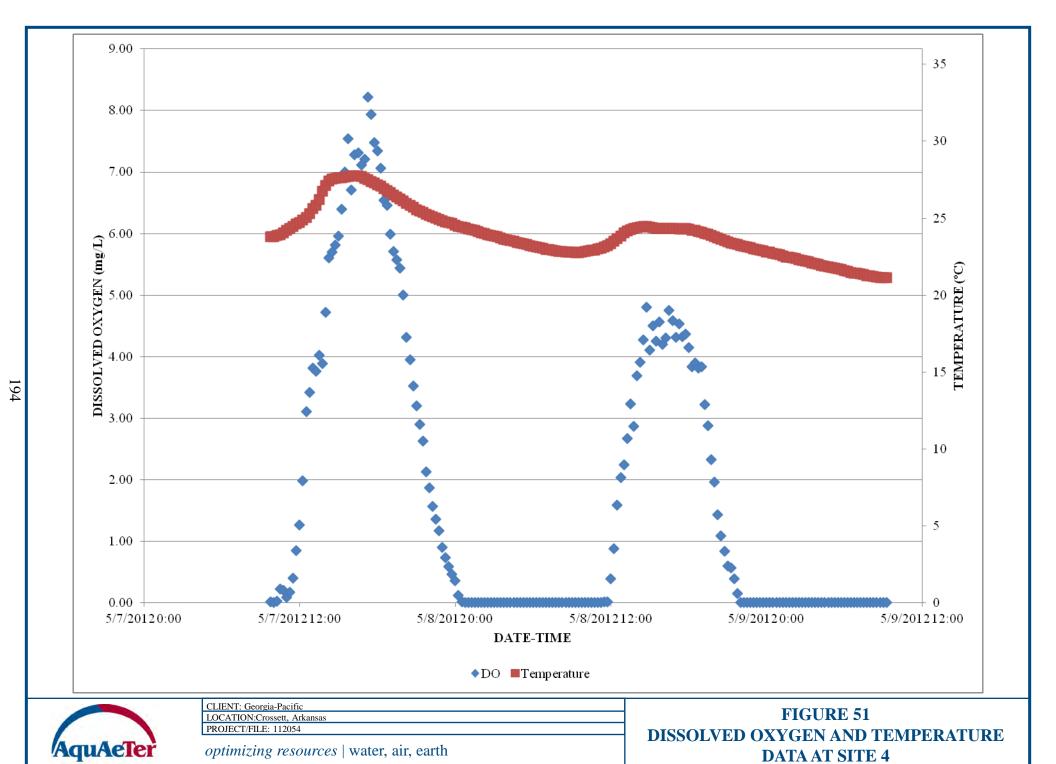
DISSOLVED OXYGEN AND TEMPERATURE

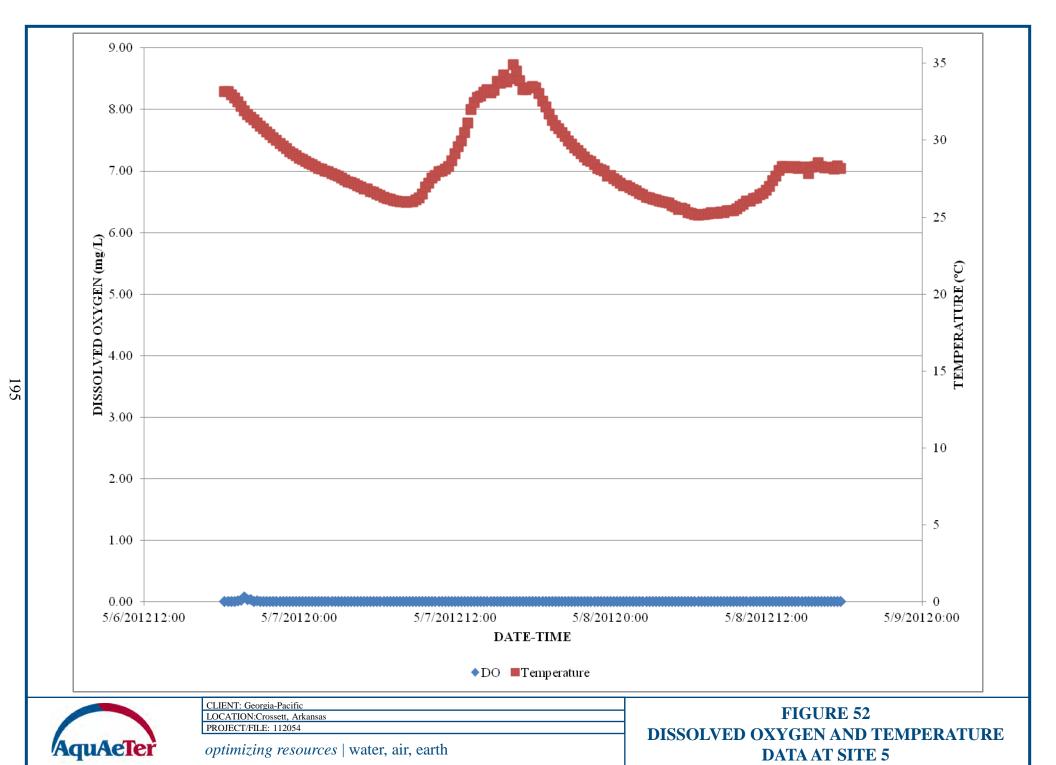
DATA AT SITE 1

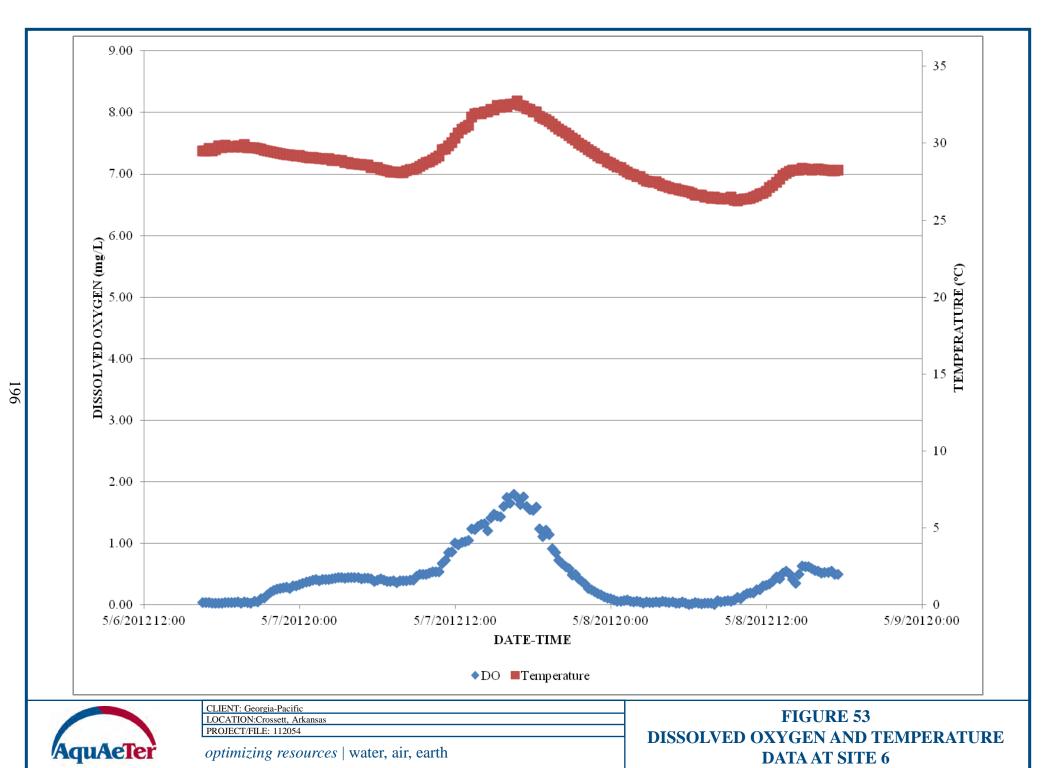
9.00













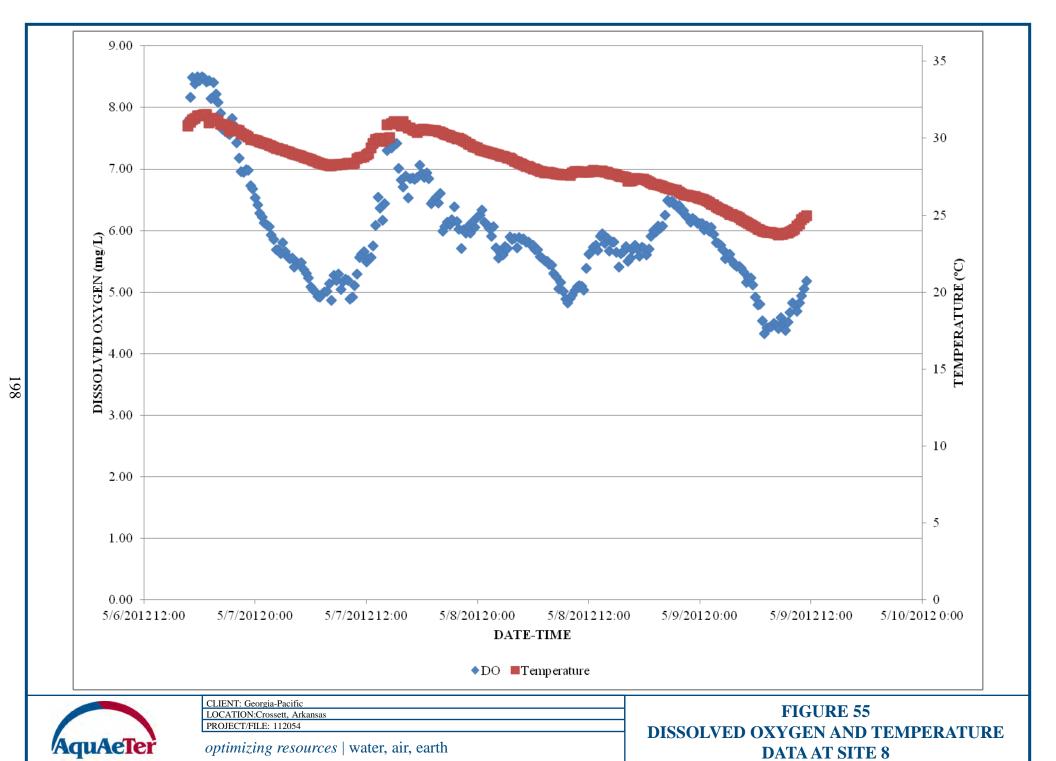
No water was present at Site 7 during the May 2012 sampling event. Therefore, no dissolved oxygen or water temperature were measured. This picture was taken during the August 2012 event. No pictures were collected of the study area at Site 7 during the May 2012 study.

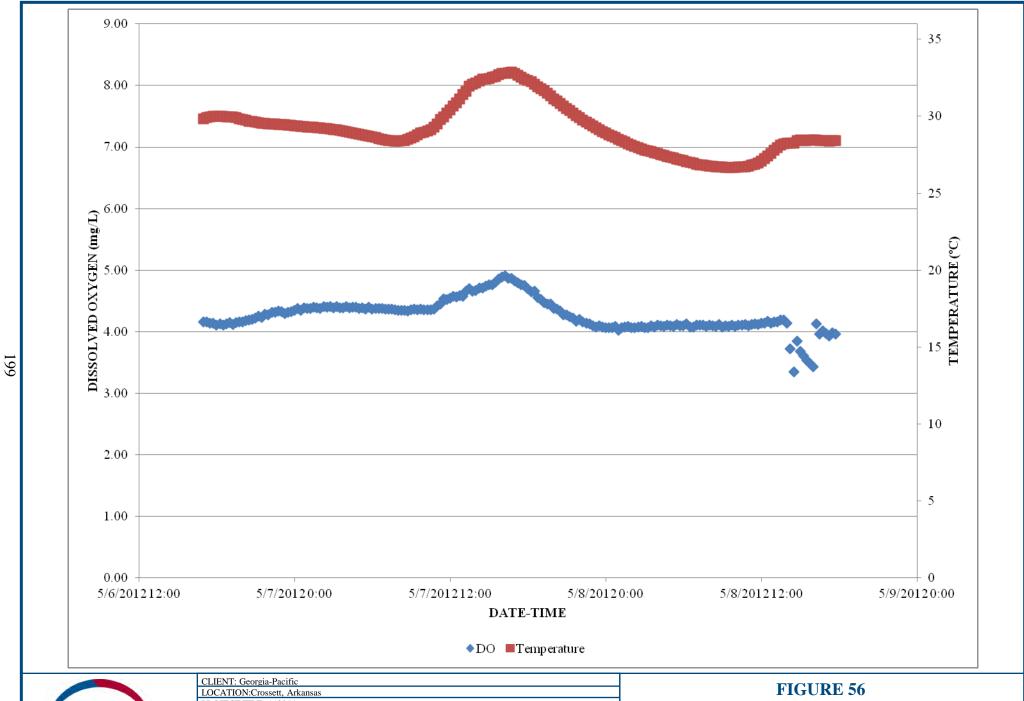


CLIENT: Georgia-Pacific LOCATION:Crossett, Arkansas PROJECT/FILE: 112054

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FIGURE 54
DISSOLVED OXYGEN AND TEMPERATURE
DATA AT SITE 7



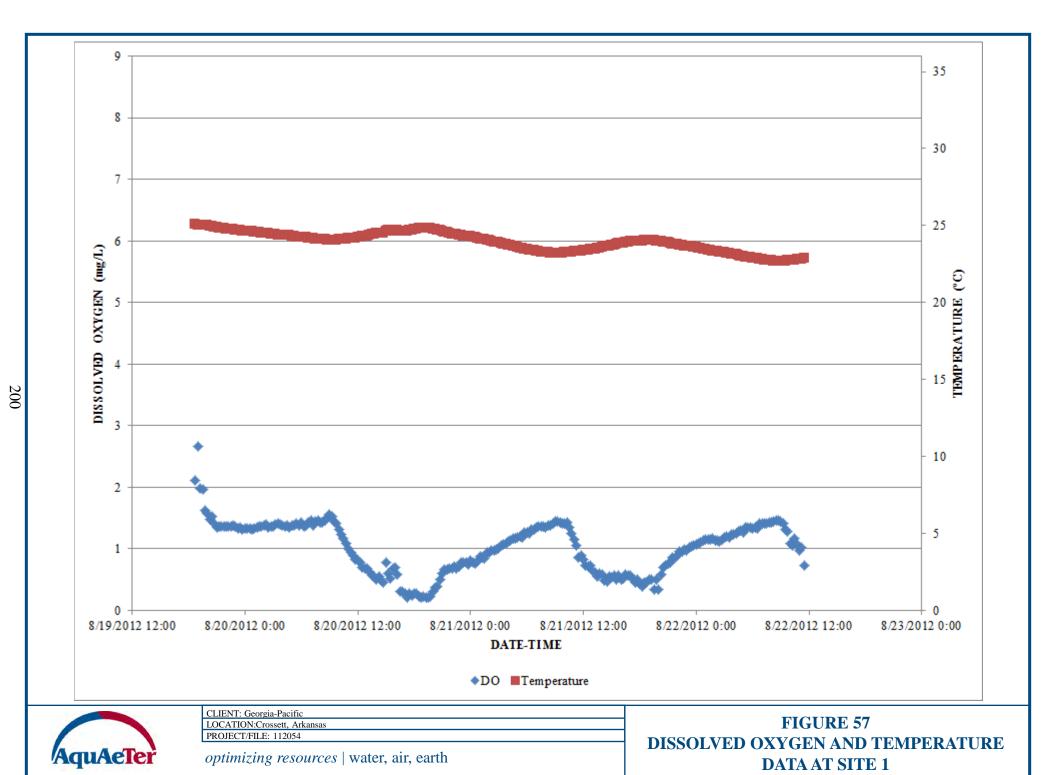




CLIENT: Georgia-Pacific LOCATION:Crossett, Arkansas PROJECT/FILE: 112054

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DISSOLVED OXYGEN AND TEMPERATURE **DATA AT SITE 9**





No water was present at Site 2 during the August 2012 sampling event. Therefore, no dissolved oxygen or water temperature were measured.



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No water was present at Site 3 during the August 2012 sampling event. Therefore, no dissolved oxygen or water temperature were measured.



CLIENT: Georgia-Pacific LOCATION:Crossett, Arkansas PROJECT/FILE: 112054

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FIGURE 59
DISSOLVED OXYGEN AND TEMPERATURE
DATA AT SITE 3



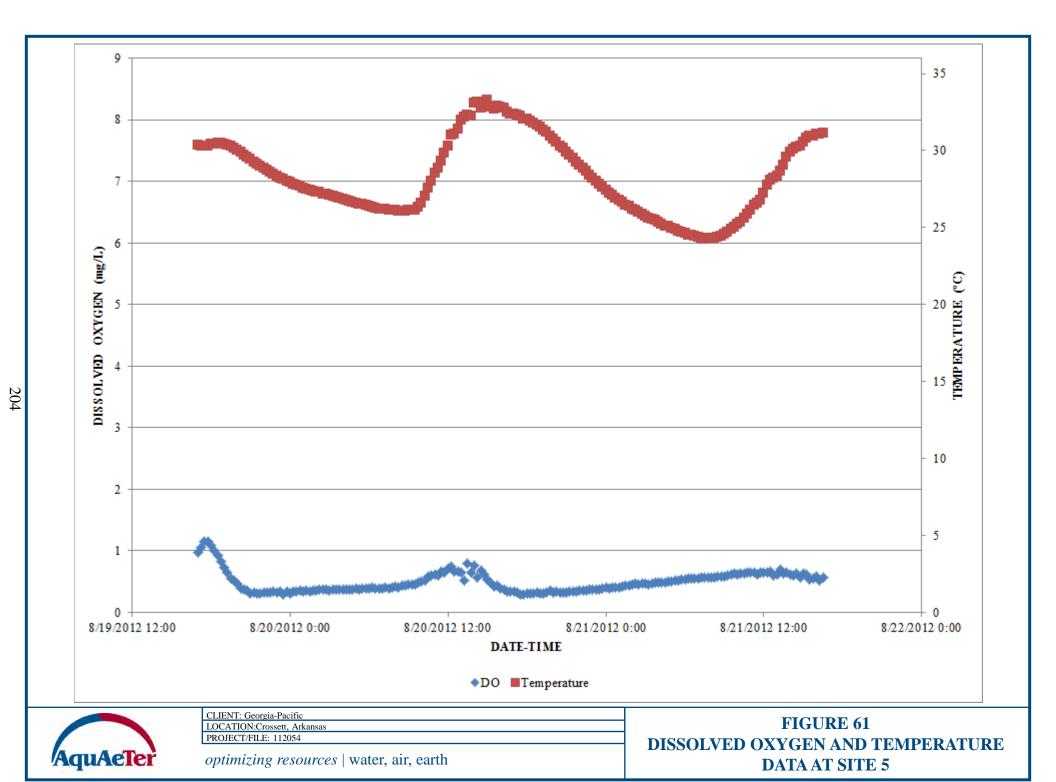
No water was present at Site 4 during the August 2012 sampling event. Therefore, no dissolved oxygen or water temperature were measured.

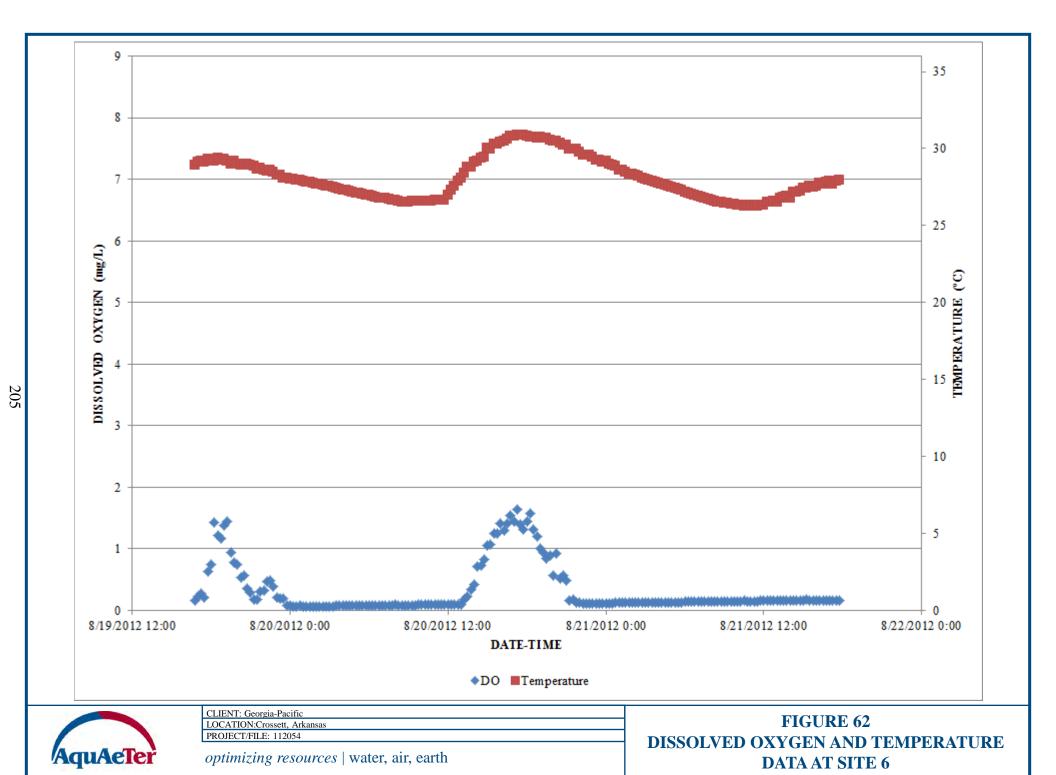


CLIENT: Georgia-Pacific LOCATION:Crossett, Arkansas PROJECT/FILE: 112054

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FIGURE 60
DISSOLVED OXYGEN AND TEMPERATURE
DATA AT SITE 4





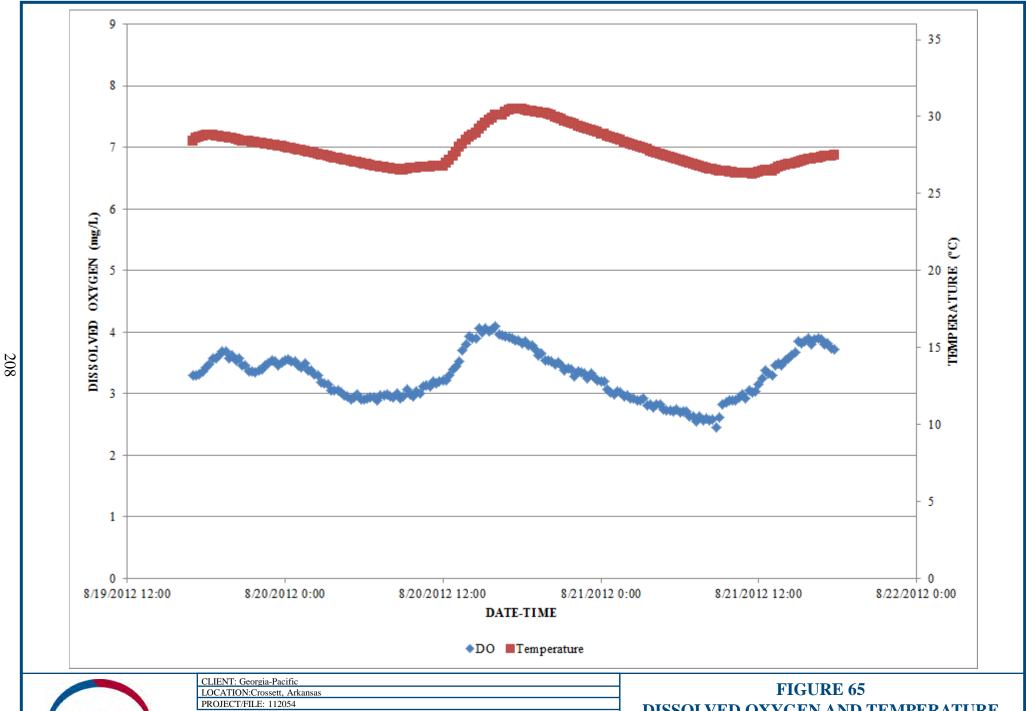


No water was present at Site 7 during the May 2012 sampling event. Therefore, no dissolved oxygen or water temperature were measured.



DATA AT SITE 8

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DISSOLVED OXYGEN AND TEMPERATURE **DATA AT SITE 9**